THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. XCIV. No. 2241.] LONDON, APRIL 24, 1906. [58TH YEAR. PRICE 6d.

PARKER & LESTER,

— *ESTABLISHED 1830.* —

MANUFACTURERS AND CONTRACTORS. **ORMSIDE STREET, LONDON, S.E.**

THE ONLY MAKERS OF

PATENT ANTIMONY PAINT & PARKER'S IMPERIAL BLACK VARNISH.

OXIDE PAINTS, OILS, AND GENERAL STORES, FOR GAS AND WATER WORKS.

SAFETY GAS-MAIN STOPPER,

FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS.

SHORT'S PATENT

GAS-LEAK INDICATORS.

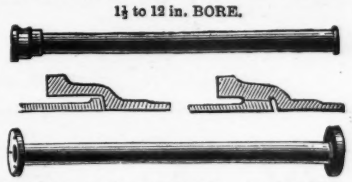
FOR GROUND USE. FLUSH BOXES ETC. HIGHLY SENSITIVE. LONG RANGE.

FOR PURIFIER BLOW-OFF VALVES. FOR HARD USAGE.

WITH ALL LATEST IMPROVEMENTS.

GAS AND WATER PIPES

1½ to 12 in. BORE.



THOMAS ALLAN & SONS, LIMITED,

Bonlea Foundry,

THORNABY-ON-TEES.

Formerly Springbank Iron-Works, Glasgow.

ESTABLISHED 1848.

Also Manufacturers of

SANITARY AND RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES STOVES, AND GENERAL CASTINGS.

Telegrams: "BONLEA, THORNABY-ON-TEES."

NORTON'S PATENT

"ABYSSINIAN" & ARTESIAN TUBE WELLS,

FOR TOWN WATER-WORKS AND OTHER SUPPLIES.

The following Town Water-Works Supplies have been obtained by this System, viz.:—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.

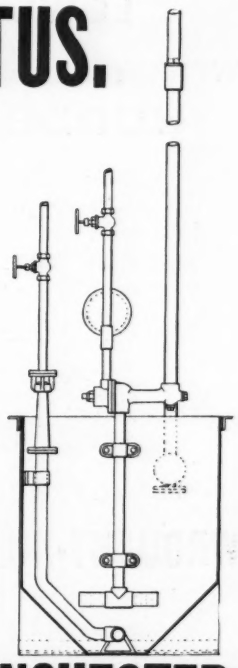
LE GRAND & SUTCLIFF,

HYDRAULIC ENGINEERS, 100, BUNHILL ROW, LONDON, E.C.

CONTINUOUS LIMING APPARATUS.

ADVANTAGES:

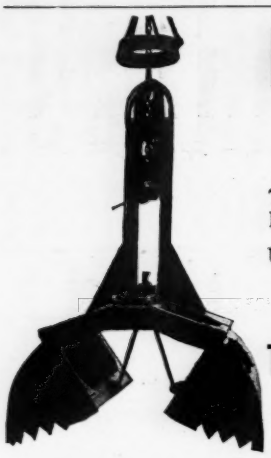
1—No Moving Parts.
2—Small Space Occupied.
3—Very Easy to Work.
4—Costs Practically Nothing for Up-Keep.
5—Gives Maximum Efficiency with Minimum Cost.



INSTALLED AT MANY GAS AND CHEMICAL WORKS.

WRITE FOR FULL PARTICULARS—

MELDRUM BROS., LTD., TIMPERLEY, MANCHESTER.



HONE'S PATENT GRABS

Automatic, Efficient, & Economical.

APPLICABLE TO ANY ORDINARY SINGLE CHAIN CRANE.

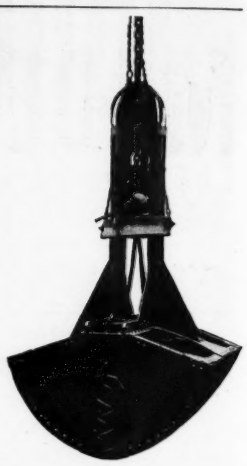
These Grabs are unequalled for handling Coal, Coke, Ballast, Sand, Macadam, Ores, &c. effecting in all cases very substantial savings.

Used by all the Principal Gas Companies, Colliery Owners, Coal Merchants, Engineers, Contractors, &c., at Home and Abroad.

Applications for Prices and Particulars are invited by the Sole Manufacturer—

THE THAMES IRON WORKS, SHIPBUILDING, and ENGINEERING COMPANY, LTD.,

CANNING TOWN, LONDON, E.



W. C. HOLMES & CO.

MAKERS OF

PELOUZE & AUDOUIN TAR EXTRACTORS,

ROTARY SCRUBBER WASHERS,

VALVES.

SULPHATE OF AMMONIA PLANTS

AND

SULPHUR RECOVERY PLANTS.

LOWE CARBURETTED WATER-GAS PLANTS.

WORKS: **HUDDERSFIELD.**

LONDON OFFICE: **11, VICTORIA ST., S.W.**

Telegrams { HOLMES, HUDDERSFIELD. IGNITOR, LONDON.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—

MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER FOR GAS, WATER, OIL, OR OTHER PURPOSES.

SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON:	MANCHESTER:	BIRMINGHAM:	LEEDS:
108, Southwark Street.	33, King Street West.	114, Colmore Row.	6, Mark Lane, New Briggate.

MODERN GAS APPARATUS.

C. & W. WALKER, LTD.

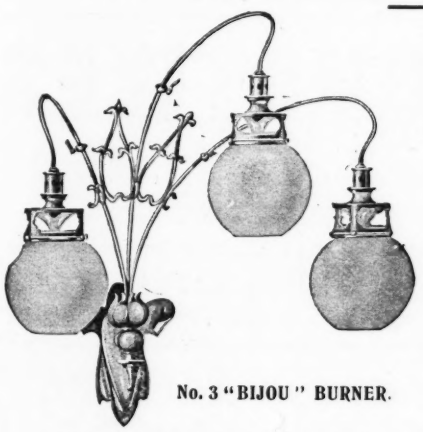
London Office:
110, CANNON STREET, E.C.

Midland Iron-Works:
DONNINGTON, near NEWPORT, SALOP.

THE

ORIGINAL NEW INVERTED BURNERS.

The "BIJOU" BURNER is the neatest, most decorative, and economical ever known, and is the real rival to Electric Light at One-Tenth the cost.



No. 3 "BIJOU" BURNER.

All Mantles we supply are made of best double-woven Ramie, and marked with our Trade Mark,

"NICO."

No. 2 BURNER.

INVERTED FITTINGS OF EVERY DESCRIPTION AND UP-TO-DATE DESIGNS.

The New Inverted Incandescent Gas Lamp Co., Ld.

23, FARRINGDON AVENUE, LONDON, E.C.

JOSEPH EVANS & SONS, CULWELL WORKS, WOLVERHAMPTON.

Telegrams: "EVANS, WOLVERHAMPTON." London Address: **Salisbury House London Wall, London, E.C.** National Telephone: No. 7089.

Please apply for Catalogue No. 8.

12,000 PUMPS IN STOCK AND PROGRESS.

TRADE MARK.

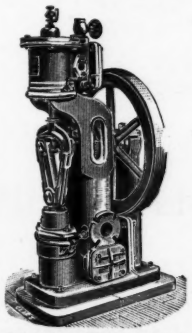


Fig. 705. "SINGLE RAM" STEAM-PUMP.

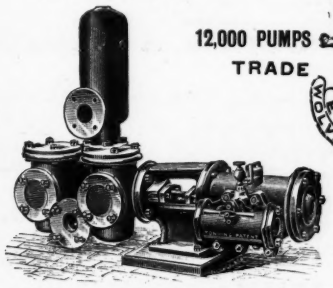


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

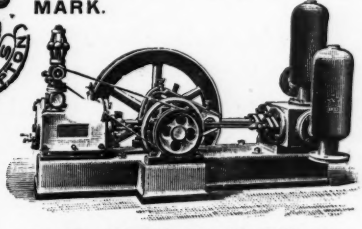


Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

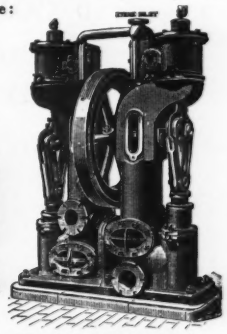
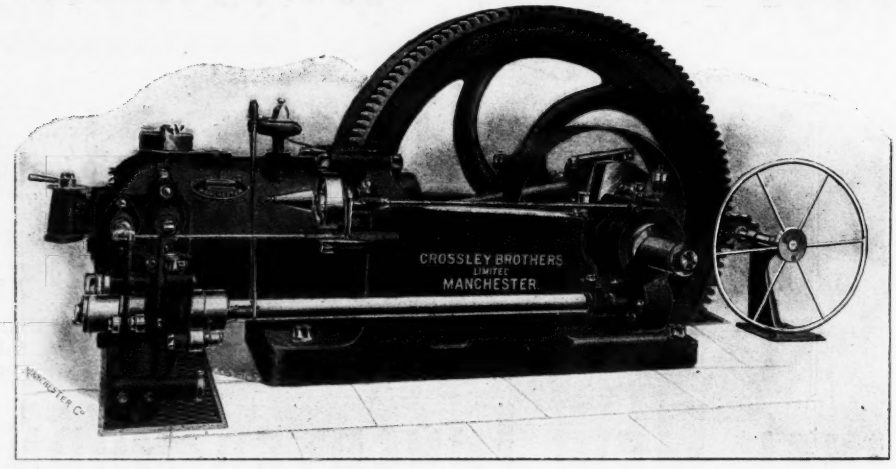


Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

CROSSLEY'S GAS-ENGINES

SUITABLE FOR DRIVING EXHAUSTERS, PUMPS, &c.



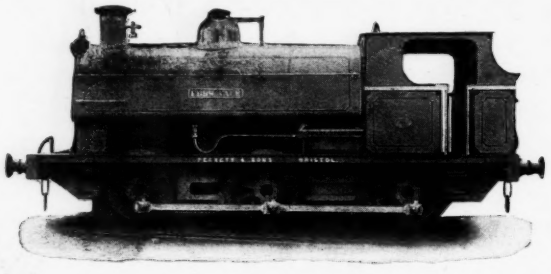
Represents XAE Type High-Speed Electric Light Engine giving 75 Effective Horse Power.

Up to the end of 1904, over 51,000 Gas and Oil Engines have been delivered, representing about three-quarters of a million actual horse power.

IMMEDIATE DELIVERY FOR STOCK SIZES OF ENGINES.

Large Number of Second-Hand Engines always in Stock.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER.



LOCOMOTIVES

LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in Stock, ready for immediate delivery.

Photographs, Specifications, and Prices on Application.

PECKETT & SONS, Atlas Locomotive Works, BRISTOL.

Telegraphic Address: "PECKETT, BRISTOL."

NEWTON, CHAMBERS, & CO.,

LIMITED.

THORNCLIFFE IRON-WORKS, near SHEFFIELD.

—— Established 1790 ——

LONDON OFFICE: 19, Great George Street, WESTMINSTER.

Telegraphic Addresses, "NEWTON, SHEFFIELD," "ACCOLADE, LONDON."

GAS ENGINEERS, IRONFOUNDERS, and CONTRACTORS.

MANUFACTURERS OF EVERY DESCRIPTION OF

PLANT, APPARATUS, AND MACHINERY FOR GAS AND CHEMICAL WORKS.
RETORTS AND FITTINGS, MOUTHPIECES WITH SELF-SEALING LIDS.
IMPROVED COAL AND COKE HANDLING PLANT, CONVEYORS, AND ELEVATORS.
CONDENSERS, SCRUBBERS, AND WASHERS.

PURIFIERS with Planed Joints a Speciality.

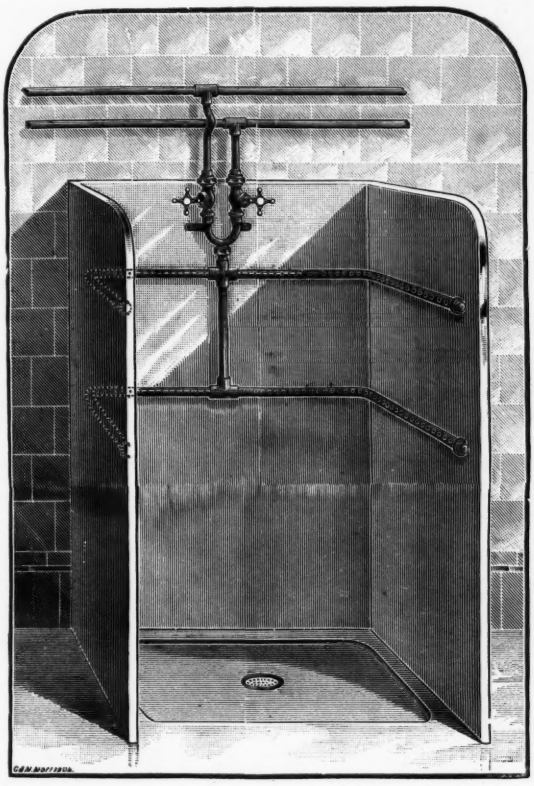
PATENT CENTRE-VALVES, RACK AND SCREW VALVES, WOOD GRIDS AND SCRUBBER-BOARDS, CAST-IRON MAINS, AND SPECIALS.
STRUCTURAL WORK, COLUMNS, GIRDERS, AND ROOFING.
GASHOLDERS, CAST-IRON OR STEEL TANKS.

DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

PIG IRON (SPECIAL QUALITY) for Engine Cylinders. GAS COAL famous for its Unrivalled excellence.

STOKERS'

Bath Fittings



No fouled Water before Washing is finished.

Soiled Water runs off immediately.

MADE BY

JAMES MILNE & SON

LIMITED,

Milton House Works, EDINBURGH . . .

Also at LONDON, GLASGOW, and LEEDS.

Gasholders

Retort Fittings Complete

PURIFIERS

Scrubbers

MAINS

Condensers

Ammonia Recovery Plant

& STEEL TANKS

Washers

VALVES

STEEL STRUCTURES

ASHMORE, BENSON, PEASE & Co. LTD. STOCKTON-ON-TEES. Telg. Gasholder.

TILLEY BROTHERS'

PATENT "SEAL" MAIN COCK.

NO NEED TO CAP SERVICES.

KEYS DO NOT FALL OFF & GET MISLAID.

FULL . . PARTICULARS—

53, KINGSLAND ROAD, LONDON, E.

EVERITT'S

PATENT TAR-EXTRACTOR

As a Naphthalene Remover.

The Exhaust Steam heats up the Tar and the Gas, and enables it to remove the maximum amount of Naphthalene. By removing the Tar, no Naphthalene is carried forward to the Scrubbers, except in strong and thorough combination with an **EXCESS** of light hydrocarbons, so evenly distributed and always sufficient in quantity to prevent the action of ammonia on the phenols liberating the Naphthalene dissolved by them.

SOLE MAKERS:

ROBERT DEMPSTER & SONS,

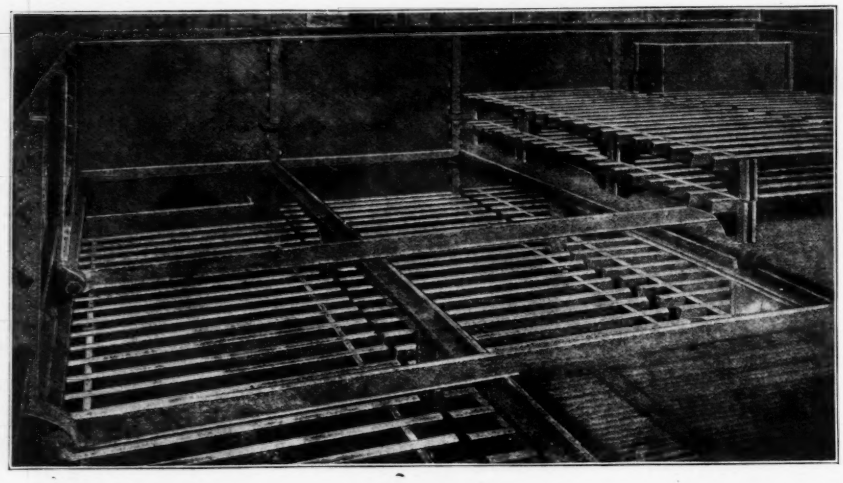
ROSE MOUNT IRON-WORKS, LTD.,

ELLAND, Yorks.

"STANDARD" PURIFYING GRIDS.

(F. D. MARSHALL'S PATENT.)

THE ONLY GRID WHICH ENSURES THE FORMATION OF SUPPORTING ARCHES.



Orders from—
ABERCARN, ABERYSTWYTH, ARMAGH, BARNET, BECKTON, BIRMINGHAM, CHICHESTER, HAMPTON COURT, HOLMFIRTH, ILFORD, KINGSTON-ON-THAMES, LEA BRIDGE, LEYLAND, LIVERPOOL, LONDONDERRY, NORTHFLEET, PORT ELIZABETH, POYNTON COLLIERIES, REDHILL, RICHMOND, ST. IVES, TICEHURST, UXBRIDGE, WORTHING.

KIRKHAM, HULETT, & CHANDLER, LIMITED,

Palace Chambers,

BRIDGE STREET, WESTMINSTER, S.W.

Sole Agents for the Berlin-Anhaltische-Maschinenbau Act. Ges. Specialities.

DRAKES LTD. HALIFAX.

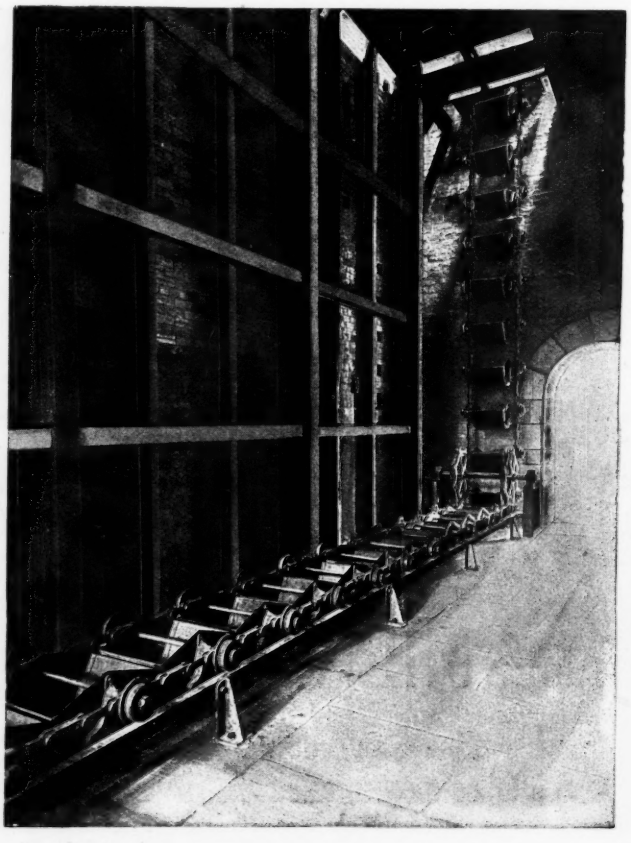
LONDON OFFICE:
181, QUEEN VICTORIA ST., E.C.

MELBOURNE:
31, QUEEN STREET.

Inclined Retort Installation,

WITH

Gravity Bucket Conveying Plant.



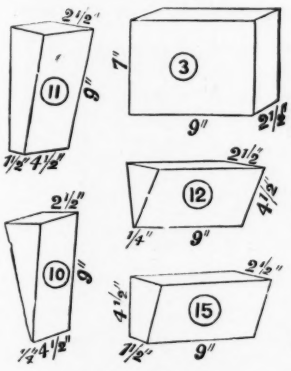
In the Spring, when a Manager's fancy broods o'er lessening sales of Gas—

That is the time
to adopt
"EUREKA"
Gas Cookers.

JOHN WRIGHT & CO.,
ESSEX WORKS,
ASTON, BIRMINGHAM.

STEPHENS & CO., KIDWELLY.

Contractors to a large number of the Principal Gas-Works.



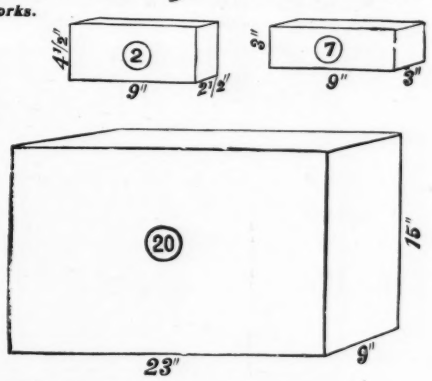
SPECIAL IMPROVED

SILICA BRICKS, BLOCKS, SHIELDS, TILES.

SPECIAL PLASTIC SILICA CEMENT.

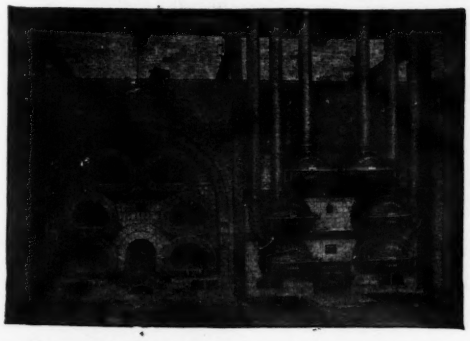
Without doubt the finest Materials in the Market for Gas-Works Furnaces.

BRICKS, BLOCKS, TILES, & SHIELDS of any shape made to order.



F. C. SUGDEN & Co.

CARBONIZING SPECIALISTS.



PHOTO, OF REGENERATOR SETTINGS DURING CONSTRUCTION.

REGENERATOR & GENERATOR SETTINGS

DEEP, SEMI-DEEP, AND SHALLOW.

Maximum Make per Ton and Mouthpiece.

Minimum Fuel Consumption.

NUMEROUS REPEAT ORDERS

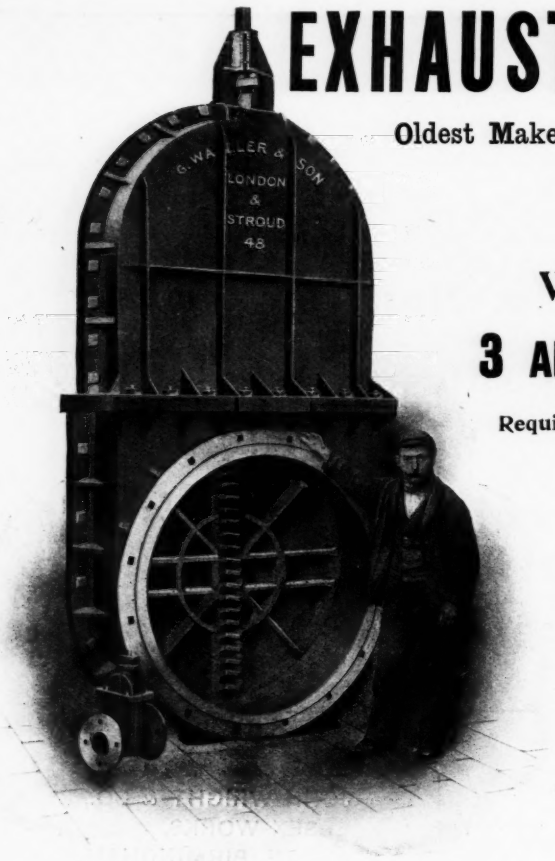
Have been received for each of the above types of Settings.

RESULTS GUARANTEED. RETORTS RESET.

SOLE MAKERS OF **CRIPPS' PATENT CHIMNEY.**

Designs and Estimates on application. **28, EAST PARADE, LEEDS.**

EXHAUSTING MACHINERY.



Oldest Makers of High-Class Exhausting Machinery of all Capacities and for all Purposes.

WALLER'S PATENT
3 AND 4 BLADE EXHAUSTERS

Require less Steam and maintain a steadier Gauge than any other type.

Over 1000 Supplied.

GEORGE WALLER & SON,

Phœnix Iron Works,

STROUD, GLOUCESTERSHIRE.

London Office:

165, QUEEN VICTORIA STREET, E.C.

Telegraphic Addresses—
Stroud: "Waller, Brimscombe."
London: "Weighbeam, London."

Telephone Numbers—
Stroud: 210 Brimscombe.
London: 2420 (P.O.) Central.

AGENTS FOR SCOTLAND:
D M. NELSON & CO., 53, WATERLOO STREET, GLASGOW.

Gas Valves of all Sizes and Descriptions.

THE CHEMICAL ENGINEERING CO. & WILTON'S PATENT FURNACE CO.,

GEORGE WILTON,
Managing Director.
Late of THE GASLIGHT AND COKE CO.

79, MARK LANE, E.C.

Telephone No. 2669 AVENUE. Telegrams: "EVAPOR TOR, LONDON."

WORKS:
MIDLAND RAILWAY GOODS STATION, HENDON.

View of Wilton's Patent Ammoniacal Liquor Still showing removing of Bubbling Weir and accessible overflows. Easy to clean. Perfect in action. A 5 feet diameter still with 12 sections will produce 15 tons of Sulphate of Ammonia per 24 hours. Test of Waste Liquor, ·01 per cent. NH_3.

CONTENTS.

EDITORIAL NOTES.

GAS, &C.—
The New Testing Clauses 215
Sliding-Scale Provisions as Others See Them 215
Inverted Gas-Burners for Street Illumination 216
The Difficulties of Suction Producer Plants 217
Belated Criticism 217
Metal Alloys for Igniting Gas-Burners—Mid-Oxfordshire Methods—The Demands of Labour—The Italian Gas Society's International Competition—The Disposal of Spent Ammonia Liquor—Patent Law Amendment 228

Gas Stock and Share Market 220
Electric Lighting Memoranda 220
The Sliding-Scale Provisions—An American View 222
American Gas-Advertising Literature . . . 224
Obituary and Personal 225
Lighting Newport (Mon.) Town Dock with High-Power Incandescent Gas-Lamps . . 226
Inverted Lamps for Street Lighting. By W. R. Herring 227
Ohio Question-Box—Manufacturing Operation and Residuals 228
Local Authorities and Water Undertakings . 229
The Earthquake at San Francisco 229
Pyrophoric Alloys. 230
Nullification of the German Self-Carburetting Patent 230
Waverley Association of Gas Managers—Half-Yearly Meeting at Peebles 231
Yorkshire Junior Gas Association—Mr. G. Herris on Unaccounted-for Gas . 232
The Question-Box 233
Photometry of High-Power Lights 235
Junior Institution of Engineers—Mr. W. A. Tookey on Suction Producer Gas Plants . 236
Thermic Considerations of a Retort-Furnace. By D. D. Barnum, of Worcester (Mass.) . 239
Architects and Artificial Illumination. . . 240
The Removal of Naphthalene 241

REGISTER OF PATENTS.

Valves for Use with Dry Mains in Gas Manufacture—Helps, G. 242
Gas-Pressure Regulators—Cook, E. S,, and Chipperfield, W. H. 242
Grids for Gas Purifiers—Morris, F. H. G. . 242
Lock for the Money Drawers of Coin-Freed Gas-Meters—Hammoud, W. H., and Bishop, E. W. 242
Coin-Freed Gas-Meters—Hutchinson, C. H. & B. G. 242
Suction Gas-Producers—Fielding, J. . . . 243
Couplings for Plain-End Pipes—Dresser, S. R. 243
Street Gas-Lanterns—Mowat, J., and Mackinnon, J. 243
Electrically Lighting Inverted Gas-Burners—Benard, P. 244
Patent Notices 244

CORRESPONDENCE.

The Future of the Gas Profession 244
Working of Retort-House Governors . . . 244
Inverted Incandescent Gas-Burners . . . 245
Electricity at Hastings 245
Coal Conservation, Power Transmisson, and Smoke Prevention 246

MISCELLANEOUS NEWS.

Cheltenham Gas Bill 247
New Gas-Works at Ayr 247
Epsom Ratepayers' Association and the Gas Company—The Question of Standard Price 247
Exhibition of Gas Appliances in Aberdeen . 248
Mond Gas and Power Transmission . . . 248
Labour Bills in Parliament 249
Fatality from Gas Poisoning. 250
The Fire Risks of Electricity 250
Water-Works Purchase Question at Portsmouth. 250

MISCELLANEOUS NEWS (*continued*)—
Southend Water Company to Buy Leigh Works. 251
Stock and Share List 251
Shrewsbury New Water Scheme 252
Notes from Scotland 252
Current Sales of Gas Products 254
Coal Trade Reports 255
Gas Supply in Bombay 255
The Costs of the Torpoint Water Bill . . . 256

PARAGRAPHS.

Purification Results 219
Calcium Carbide and Fire—Coal Testing in America 221
London and Southern District Junior Gas Association 224
Prismatic Shades—German Association of Gas and Water Engineers—Scottish Junior Gas Association (Eastern District) . . . 226
Incandescent Gas Litigation in Germany . 227
Annual Meeting of the Société Technique du Gaz—The Vertical Retort-Settings at Mariendorf—An Italian Concrete Water-Tower . 230
Electrical Manufacturers' Association and Exhibitions 232
Boiler Explosions—Gas-Heated Baths . . 236
Wethered's "Compound Division Cost-Sheet Ready Reckoner" 238
Silsdon Gas Supply 253
Water Supply Needed at Felsted 254
Church Lighting by Incandescent Burners—Public Lighting Ideas at Dolgelly . . . 255
Teignmouth Water Supply—Fatal Accident at Mitcham Gas-Works—Gas Profits at Manchester—Unsanctioned Expenditure at Leeds 256
Sale of Shares—Incandescent Gas Lighting for Railway Carriages—Gas Preferred to Electricity—Rochdale Gas, Electricity, and Water Supply—Electric Power Monopolies—New Joint-Stock Companies — Local Government Board Inspector on Incandescent Gas Lighting—Slot-Meter Robberies 257

ONE-THIRD OF THE TOWN GAS CONSUMED BY ALL ENGLISH SPEAKING PEOPLES IS NOW

CARBURETTED-WATER-GAS.

Messrs. Humphreys & Glasgow and their American Colleagues, The United Gas Improvement Company, have jointly constructed **852** Sets of Double-Superheater Plant, aggregating a capacity of **643,200,000** cubic feet per day. This represents over **80** per cent. of all Carburetted-Water-Gas Construction throughout the World.

HUMPHREYS & GLASGOW.

36 & 38, VICTORIA STREET, LONDON, S.W.
Telegrams: "EPISTOLARY LONDON."

UNITED STATES OFFICE:
31, NASSAU STREET, NEW YORK.

THOMAS GLOVER & CO.'S

PATENT NEW IMPROVED PREPAYMENT METER

For Pennies, Shillings, or any Coin.

Simple in Mechanism.
Positive in Results.
Price Changer *in Situ*.

GUARANTEED FOR FIVE YEARS.

Telegraphic Address: "GOTHIC, LONDON." Telephone No. 6159 Bank.

THOMAS GLOVER & CO., LTD.,

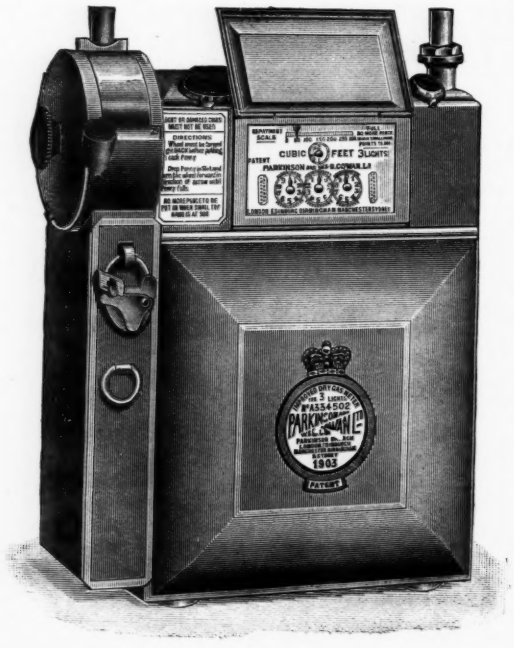
GAS-METER MANUFACTURERS,

LATE OF CLERKENWELL, NOW 49, QUEEN VICTORIA STREET.

Telegraphic Address: "GOTHIC, LONDON." Telephone No. 6159 Bank.

BRISTOL:	BIRMINGHAM:	MANCHESTER:	GLASGOW:	BELFAST:	MELBOURNE:
28, BATH STREET.	57 & 58, BROAD STREET.	132 & 134, CORN EXCHANGE BUILDINGS.	26, WEST NILE STREET.	8, EXCHANGE PLACE, DONEGALL STREET.	23, WRIGHT'S LANE, LONSDALE STREET.
Telegraphic Address: "*GOTHIC.*"	*Telegraphic Address:* "*GOTHIC*"	*Telegraphic Address:* "*GOTHIC.*"	*Telegraphic Address:* "*GASMAIN.*"	*Telegraphic Address:* "*GOTHIC.*"	
Telephone No. 1005.	Telephone No. 5009.	Telephone No. 3898.	Telephone No. 6107 Royal.		Telephone No. 3716.

PARKINSON'S



PREPAYMENT METERS

For Pence, Shillings, or any Coin.

SIMPLICITY . .
DURABILITY . . } COMBINED.
EFFECTIVENESS

PARKINSON AND W. & B. COWAN, LTD.
(*Parkinson Branch*),

COTTAGE LANE, CITY ROAD, LONDON.	BELL BARN ROAD, BIRMINGHAM.

JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. XCIV., No. 2241.—TUESDAY, APRIL 24, 1906.

EDITORIAL NOTES—GAS, &c.

The New Testing Clauses.

IN the issue of the "JOURNAL" for March 20 was published the text of certain clauses proposed by the Chairman of Committees in the House of Lords (Lord Onslow) for insertion, where applicable, in all Bills before Parliament, with the object of securing uniformity of testing, with special reference to illuminating power. These clauses provided for the adoption in all cases of the new "Metropolitan" No. 2 burner, and the method of testing recently prescribed by the Gas Referees for the Metropolis; and they have already been inserted in one or two instances, although presumably subject to any alteration that may have since been, or may hereafter be, determined upon. Uniformity of testing is such a very desirable thing in itself, that it is certain no objection will be lightly taken to the clauses when they assume their final shape. Meanwhile, it will be of assistance to all concerned if attention be directed to such modifications as appear desirable in order that the clauses may be generally acceptable.

Uniformity could have been secured without any alteration of the burner, if only the London County Council could have seen their way to accept, in lieu of a uniform rate of consumption, a fixed height of flame or a fixed illumination. One of these two conditions is necessary, in order to obtain proportionate results with the London Argand burner from gases of different qualities. But, with a strange perversity, the London County Council clung to the recommendation of the Board of Trade Committee in favour of reversion to the 5 feet rate of consumption, and, rather than give up the point, conceded that which is not only a confirmation but also an extension of the provision of the 1868 Act, which has been rightly regarded as the charter of the Companies with respect to testing for illuminating power. The Act of 1905, to which the Council were assenting parties, declares that the testing-burner shall be "the most suitable for obtain-" ing, and in making the test shall be so used as to obtain, " from the gas, when consumed at the rate of 5 cubic feet an " hour, the greatest amount of light." This provision has proved to be of the greatest value, because it has secured to the Companies the use of an improved burner, with adjustable air supply, which makes it suitable for all qualities of common gas; so that, by its means, uniformity of testing is practically secured. So far so good.

The clauses, however, also provide for the employment of the method of testing prescribed by the Gas Referees, which includes the use of the table photometer, as to the advisability of which there is by no means unanimity of opinion. Objection was taken in these columns to the continued use of this instrument when the recent notification of the Gas Referees first made its appearance; and further consideration has strengthened and confirmed the opinion then expressed with regard to it. The table photometer was all very well as part and parcel of the fixed illumination method; but, when this had to be abandoned, the time had arrived for a reconsideration of the position in this respect. It may well be that the Gas Referees were influenced in their decision to retain the table photometer by a reluctance to put the London Companies to the expense of a change of apparatus; but the unforeseen will happen if, as appeared likely at one time, the model clauses should provide for the adoption of the table photometer in all cases. In that event, the Gas Referees will have been the unwitting cause of expense being incurred by companies less able to afford it than are the great London Companies, inasmuch as the bar photometer is at present almost universally used outside the Metropolis. Nor is such an alteration in any way to be described as an improvement. On the contrary, the moving of the flame under test which is necessitated by the use of the table photometer under the altered conditions of testing, cannot be described as other than a disadvantage, not unlikely to lead to inaccurate results being obtained. At any rate, it is much preferable, and, we venture to say, more scientific to move the screen (as is the case when the bar photometer is used) than to move either the light under test or the standard lamp. It is greatly to be hoped that the Gas Referees will be able, before very long, to see their way to undo the mischief which has undoubtedly been done in this direction, and prescribe the bar as a substitute for the table photometer.

In the meantime, it is satisfactory to learn that the authorities of Parliament are inquiring for themselves into the relative merits of the two forms of photometer, and there are rumours of a visit having been paid to Horseferry Road for this purpose. It is said also that considerable discussion took place on that point when the South Suburban Gas Bill went before the Lord Chairman; and it is greatly hoped that, as the outcome, the question of the photometer will be left an open one, so that those who elect to do so may continue to use their bar photometers. These with 10-candle standards and "Metropolitan" No. 2 burners form as perfect instruments for testing gas for illuminating power as can be desired.

Sliding-Scale Provisions As Others See Them.

ELSEWHERE in the present issue is given the substance of a very important report presented to the Legislature of Massachusetts by a Committee appointed to inquire into the working of the sliding-scale as applied to gas companies in England, and the suitability of its application to the gas companies of Boston and the neighbourhood. On first thoughts, there would not appear to be any particular difficulty in deciding upon the merits of a system which establishes equitable co-partnership between the consumers and the suppliers of gas, under which the latter can only flourish in proportion as they confer the benefits of cheap gas upon the former. It is this system which has found increasing favour in this country since its inception and adoption by the London Companies thirty years ago; and that it has acted as an incentive to production and distribution at the lowest possible cost, is not seriously disputed. The Board of Trade returns, in fact, reveal the actual results achieved under this system, as compared with that of maximum dividends and maximum prices of gas. There is, however, no need to take anything on trust, even with the figures in front of one; and the Committee did wisely in deciding to investigate the subject on the spot.

The result, however, is almost what might reasonably have been expected from the composition of the Committee. The majority of three constituted what is known as the Board of Gas and Electric Light Commissioners, who exercise extensive and permanent jurisdiction over all the gas and electric light undertakings in Massachusetts. This majority has presented a report composed for the most part of a *résumé* of the history of gas legislation here and in Massachusetts, in which the different lines on which legislation has proceeded in the two countries is made apparent. Here it has almost uniformly been the result of practical agreement between Parliament and the Companies; whereas in Massachusetts almost every measure adopted for bringing the Gas Companies under control may be fairly described as coercive. Which of the two methods has, on the whole, been productive of the best results cannot be much in doubt, if regard be had to the prices now paid for gas in the two countries; while the condition of gas affairs which until recently existed in Boston was such as to be a standing disgrace to any system of legislature. It has landed the consumers into the position of having to pay a very high price for gas, consequent upon the necessity of finding dividends upon a grossly excessive capitalization. No wonder, therefore, that doubts should be entertained in some quarters as to the efficiency of the present system of control. Those, however, who may be hoping to find a remedy for existing abuses in the adoption of the sliding-scale provisions, will

not derive much encouragement from this majority report, which is tinged with conservatism to a degree, perhaps, possible only in America. The sliding-scale is damned with faint praise, while full credit is given to the auction clauses and extension of borrowing powers for the part they have played in cheapening gas in the United Kingdom.

It is astonishing to note, moreover, apparently as a reason against the introduction of the sliding-scale, the suggestion that economy in the cost of production and distribution may have been so far attained that a reduction in price may be chiefly possible through a reduction in the capital charge, "the amount of which will depend in part upon the activity "of the management, and in part upon the general in- "crease of population and an improvement in its financial "condition." Granted that there is less scope now than formerly for economy in the manufacture and distribution of gas, is there to be no further incentive to improvement in these respects, and no inducement held out to practise economy in capital expenditure? It might possibly have been thought that New Englanders were the last people in the world to sit still, and let things "hum" automatically; but such does not appear to be the case. Fortunately, however, for their credit, the two independent members of the Committee disagree entirely with the attitude of their colleagues. Their report is in refreshing contrast to the halting opinions expressed by the majority. They state in unequivocal terms their opinion that the sliding-scale has worked well in the United Kingdom, and that they see no reason why it should not work equally well in Boston. Neither do we. It is practically the only system which, by appealing to the self-interest of the gas shareholder, removes from him the temptation to inflate capital unduly, and urges him to a policy of progression as regards gas supply. It is greatly to be hoped, in the interests of the gas consumers of Boston, no less than in those of the gas shareholders, that this vigorous and outspoken report of the minority will prevail over the obstructiveness of their colleagues.

Inverted Gas-Burners for Street Illumination.

A CONTRIBUTION to our columns to-day by Mr. W. R. Herring—in kindly compliance with a request made to him recently—will, we think, greatly encourage trial of the merits of the inverted gas-burner for street illumination. When, during last October, special attention was directed in the "JOURNAL" to the studious and helpful investigations of Professor Drehschmidt, the learned Chemist of the Municipal Gas-Works of Berlin, into the light-distributive powers of gas and electric lamps, including the much-lauded flame arc lamp, for street lighting, the hope was expressed that practical trials of the inverted burner for street illumination would be made in this country, and that the results would be published as early as possible. At that time, it was not within our knowledge that experiments with inverted incandescent burners for street purposes had been proceeding in Edinburgh since the fore-part of 1904; but when the information did by chance reach us, Mr. Herring was invited to relate his experiences. Hence the article under notice.

In the first place, there could be no greater corroboration of satisfaction than the plainly-stated concrete fact with which Mr. Herring commences his notes—that the Committee of the Edinburgh Corporation responsible for the lighting of the city have resolved to recommend that the whole of the flat-flame gas-burners in the street-lamps shall be converted to the incandescent system, and, what is more, to burners on the inverted principle. An important feature of the announcement—whether or not the City Council eventually agree to the recommendation—is that there are no less than 6000 lamps involved; and therefore, if the project is consummated, Edinburgh will stand unique among cities in its lighting arrangements. The reason there has been, in this instance, so great a delay in the complete transition from flat-flame to incandescent lighting is that of annual cost. With the high candle-power gas which Edinburgh has hitherto favoured, but it is hoped will not persist in favouring, the flat-flame burners were rated to consume only 2 cubic feet of gas per hour; and the smallest incandescent burner of the ordinary type that could be officially approved was one consuming 3 cubic feet per hour. On the thousands of street-lamps in the city, the extra foot per hour would have meant a very considerable addition to the annual cost for gas; and the Corporation have had difficulty in reconciling themselves to the belief that the increased illumination would justify the additional expense. Thus it is seen how a high illuminating power gas has been the radical hindrance to the complete installation, in those streets of Edinburgh where electricity is not in use, of the benefits of scientific progress in gas illumination; for if a low illuminating power gas had been the vogue, the consumption of the flat-flame burners would have been about equal to that required by the incandescent burners. But whatever the candle power of the gas, consideration has to be given to the small cost addition relatively to the much greater illuminating power realized.

Deferment, however, has permitted of experience being obtained which satisfies the Lighting Committee that, with gas at 2 inches pressure, used at a rate of only 2·20 cubic feet per hour in an inverted burner fixed in a street-lamp, a light of no less than 72 candles can be obtained, or to be exact 32·73 candles per cubic foot of gas consumed per hour. That is the evidence of one of the lines in the last table in Mr. Herring's article; and it is really an excellent duty, even though full credit be given to the high calorific power of Edinburgh gas. We do not know whether the burner furnishing this return is the one that the Lighting Committee will be advised to adopt if the sanction of the Corporation is secured to their scheme; but there will be many gas engineers who will be curious to learn the name of the burner designated by the secretive reference letter "K." But, however amiable Mr. Herring may be in giving, in the cause of technical progress (not only in this matter but others), of his experience for professional criticism or assistance, it is, of course, no part of his business to directly advertise the burners of any particular maker. At the same time, there will be many on the alert to ascertain the burner that will be considered best adapted for Edinburgh if the scheme goes through; for though the constitutional qualities of the gas there supplied may be richer than is the general rule, the adjustment of the primary air supply to the burner should give, where gas of lower illuminating power is supplied, results proportionately good, having regard to the difference in candle power. The figures supplied in the article not only show that there are wide variations—as was found by Professor Drehschmidt during his experiments in Berlin—in the efficiencies of different makes of inverted gas-burners, but at the beginning of the Edinburgh trials, very considerable difficulties were experienced in the governing of the burners; and without dependable governing much trouble would undoubtedly arise from the varying pressures that are inseparable from the distribution of gas in a district of such diverse levels and consumption drafts as are rife in Edinburgh. Naturally the consumption varies with changeable inlet pressures; and it is impossible that every street burner can be constantly receiving individual adjustment of the gas-tap or the primary air supply. But the difficulty in Edinburgh has been surmounted; and with the burner inlet pressures at approximately 2 inches, there is no difficulty. The test included in the article of an inverted burner that had been in use in the open during an entire winter is of interest, showing as it does that the illuminating capability of the burner had not suffered any depreciation by its exposure—the test returns being between 30·33 and 32·86 candles per cubic foot of gas consumed. There is one point missing from the article, on which information later on will be useful, and that is as to the manner of accommodating the inverted burner in the Edinburgh type or types of street lanterns. Professor Drehschmidt found that, when fitted in the old lanterns of Berlin, the inverted burner cast rather sharp shadows. Perhaps on some future occasion, we shall learn something on this head from Edinburgh.

However, we have it from Mr. Herring that the street-lamps fitted with inverted burners in 1904 have stood the test of time with all its atmospheric inconstancies, some of which have been of a very stressful character. The further testimony in the article is that there is a marked superiority both in the appearance and in the effective illumination of a lantern fitted with an inverted burner as compared with the same lantern fitted with an upright burner. Mr. Herring has not had an opportunity of measuring the spherical illuminating power of the inverted burners; but Professor Drehschmidt's diagrams, published last October, demonstrate that the distributive power of inverted burners—when given a proper burner and mantle, one sufficiently deep to give lateral illumination—excels all other forms of lighting, electric arc lamps not excepted. This evidence from Berlin supplementing their own experience should assist the

Edinburgh Council to determine to accept the recommendation of their Lighting Committee to give the streets of the city the maximum illuminating power to be obtained from the quantity of gas (or a fraction of a cubic foot per hour above it) now consumed per flat-flame burner.

The Difficulties of Suction Producer Plants.

It will have been observed from our columns of late that the interested champions of suction producer plants have been very active in telling the brighter side of their tales before various organizations in different parts of the country. Statements are culled from these papers, and sent broadcast, through the daily and industrial Press, to manufacturers, who are attracted by the prominence accorded to the professed ability of such plants to produce from them from 10 to 20 brake horse power, according to the conditions, for a penny per hour for fuel. Of course, the manufacturer is fascinated by this apparent cheapness; and no one comes forward to inform him through the same channels—the only effective channels by which to reach him—that the penny is only part of the story. There are the capital charges, the labour, the renewal and depreciation costs, the expense for water; and as the occupation of the operator exposes him to the poisonous gases from leakages (unless there is constant expert inspection to prevent them) and to their escape through inadvertence, there is the ever-besetting liability to compensation claiming recognition. No one in the gas industry has yet considered it to be his business—if absence of intelligence to the contrary may be taken as an honest indicator—to go outside the organizations of the industry, and appear before engineering or other technical and industrial bodies, to expose the subtle claim and fallacy, and show on which side, all things considered, the genuine balance is to be found. For all the extra expenditure that falls on the manufacturer by reason of his adoption of such a plant must be taken into the reckoning when comparing with the town's gas supply, which causes him no trouble, is always available and constant, can be obtained at a definite, and now in many cases moderate, figure, and is subject to no adventitious charge.

Since the first suction plant was put down (the first, by the way, was rather remote from success), eleven years have passed; and still the condition of reliability has not been attained. Although many makers have entered upon the search for perfection, they are still groping about among a number of difficulties well known to them, but which the user only meets with when he has bought his plant and set it to work. These difficulties—for he soon finds the opportunities for erratic conduct are not a few—are ever plaguing him. Information regarding certain of them can be found in the paper read by Mr. W. A. Tookey, as well as in the discussion, at the meeting of the Junior Institution of Engineers on Friday night. There was some plain speaking on that occasion—plainer, perhaps, than the makers of suction-gas plants will care to see, plainer, perhaps, than some of those who spoke will think, on reflection, is wholesome for the business in which they are engaged. If, by good fortune, manufacturers learn from Mr. Tookey and Mr. Hal Williams how soon suction-gas plants get out of date in the meritorious effort to overcome the troubles and irregularities of the existing plants, they will ask themselves whether, until a more settled and trustworthy condition is reached, the time is favourable for them to commit the mechanical power of their establishments to the present uncertainties of the system. If the plants change so quickly in important parts of their design, the manufacturer investing capital in one may on the morrow be working with an uneconomical plant in comparison with neighbours who are his competitors.

It is clear from the paper that any manufacturer investing in one of these plants must have a duplicate (thus practically doubling the initial capital expenditure), or have the town's supply as a stand-by; and the latter, without proper compensation, the gas industry cannot afford to continue to let him have—in fact, a mere ancillary position in relation to a competitor is not to the liking of the industry. One speaker in the discussion last Friday referred to the difficulty of starting suction plants, citing a case where the town gas supply was used for this purpose, and then, when the suction plant had been coaxed into the condition necessary for the performance of its functions, the town supply was dispensed with. But gas undertakings are now considering the propriety of obtaining power to refuse stand-by supplies, except on certain conditions. This brings us back to the necessity for duplicate producer plants. It is all very well on paper or *vivâ voce* to make light of repairs and renewals. Where a manufacturer only possesses one single plant, unless his demand for motive power is an extremely intermittent one, the cost of repairs and renewals (which can only be done by skilled workmen, and therefore not at a minute's notice) is not the sum of his loss. There is, without he has an alternative means of obtaining his motive power, the loss sustained by his deprivation—temporary it may be—of motive power. Fire-brick linings may, with moderation on the part of the man handling the clinkering tool, only want renewing once in twelve or eighteen months, the vaporizers get impaired and also want renewing, the coal-hoppers and other parts where steam and high and changeable temperatures are concerned get out of order; and it is not likely that all the component parts of the plant will, out of consideration and respect for their owner, fall due for repair simultaneously, so that the plant will thereafter run without stoppage for repair again for (say) another period of twelve or eighteen months. There is something yet to be learned on this question of renewal and depreciation. Then, the vaunted simplicity of the plant notwithstanding, there are, the paper and discussion show, several ways in which troubles may arise, any one of which may upset uniformity of working and obstruct operation; one of the chief being the variations in the quality of the gas according to the condition of the charge and the speed of the engine. Therefore constancy is not a thing upon which the user must place any great reliance.

Another trouble is the education of the operators of suction-gas plants. Here, in this discussion, we find two men expert in the operation of these plants alleging that makers have not hitherto shown any capacity for giving proper instruction as to their operation. There appears also to be a tendency to depart from primitive simplicity to complication in the endeavour to surmount the difficulties disclosed by accruing experience. Mr. Tookey, too, talks of the necessity of equipping suction plants with a lot of little devices for the prevention of accidents; and the same authority speaks of the plants getting a bad name through want of consideration in this regard. Danger to the operators lurks round the plants; and while the death-yielding gas can be set loose not only by foolishness but by inadvertence and accident, it ill becomes any man to speak in such light vein as "we can make these things fool-proof, but not "idiot-proof." There are accidents and accidents; and the power-gas people will soon begin asking themselves why, with no regulation over private producer and suction-gas plants, they should be limited, as in some Acts they are, to 14 per cent. of carbon monoxide in the gas they propose to distribute. However, the operators of these plants must of necessity all be skilled men, whose actions are ordered by a due sense of responsibility. They must have a complete knowledge of the details and working of the plant under their charge, to the end that they may safeguard the interests of their employers, get the best possible work out of the plant, and last, but not least, protect their own lives. Is the penny per hour for fuel for a specified brake horse power the *alpha* and *omega* of this suction-gas plant question? We claim the right to the opinion that it is not.

Belated Criticism.

The inverted burner forms the subject of an editorial article preceding this; but there is reason for bringing it under notice again—not in regard to any special application, but on account of the derogatory statements contained in the paper that Mr. Victor A. Rettich read at the recent meeting of the newly-formed Illuminating Engineering Society in New York, and which paper was published in our issue of the 3rd inst. The policy of the "Journal" is to advocate the fullest technical criticism and discussion whenever there is a chance of the result being improvement, or whenever criticism and discussion will expose claims that cannot be substantiated, and therefore which may be in their effect very injurious to the industry. We do not say that the inverted burner has reached the summit of perfection. But to read Mr. Rettich's paper, one might imagine, if not tutored by experience, that the inverted gas-lamp was a dead-failure; and that the claims made for it could not be vindicated by the results. It is not a failure. It is a most remarkable

success; and it gives to the gas industry an instrument of great potency in the competition of the lights. It is true that the inverted gas system has not always been all this; and it is equally true that much of Mr. Rettich's criticism and—in the present day—calumniation would have been fair and useful during the times of the development of the inverted burner. What he has done, however, has been to rake over the dead ashes of the past, and point to what he finds there as the representation of realizations by the modern, improved forms of inverted lamps—realizations the fruit of the knowledge gained in the past. The representation is not true.

An electrical contemporary published in England has taken hold of Mr. Rettich's paper, accepted it, and has given vent to loud hurrahs in the innocent belief that the long list of old defects and objections put forward constitute an indestructible indictment of misdemeanour on the part of the form of gas-lamp that electricians have of late particularly abhorred, because of its high efficiency, divisibility into small units without degrading the duty obtainable per cubic foot of gas consumed, and decorative qualities. The contemporary in question says that the inverted burner has been proved to be "merely a turnip with a very poor candle." Let electricians be cajoled into a feeling of security by such flippant writing as this, and we are inclined to think they will early find cause for regret. In our "Correspondence" columns, Mr. George Helps deals with Mr. Rettich's indictment of inefficiency; and every user of the modern forms of inverted burner—including those pleasing ones of the bijou type—can subscribe to Mr. Helps's testimony. We cannot understand how the author of the paper thought it could in any way serve (if he did so think) the interests of the gas industry, nor, in fact, how it was he came to write parts of it. But Mr. Rettich—who, we may inform electricians in this country, is not a gas engineer, as the title is commonly employed here—is concerned in some excellent incandescent gas-burners that are not of the inverted type.

Metal Alloys for Igniting Gas-Burners.

The "Journal für Gasbeleuchtung" has given its readers some account of Baron Auer von Welsbach's pyrophoric metal alloys; and particulars therefrom are reproduced in another column. These alloys, it is believed, have a large field of usefulness before them for purposes of ignition; but the application in which our readers will be immediately interested is that of the ignition of gas. The reference to the invention by our German contemporary at the present time has no doubt been prompted by the attention that is being given to the devising of the mechanical arrangements that—to produce the friction creating the sparking—are necessary to the practical service of the metal alloys. So far as the alloys themselves go, readers have been in possession of information about them since 1904. On June 28 (p. 960) of that year, an abstract of Welsbach's patent specification was published in the "Journal;" and on Dec. 20 (p. 910) special reference was made to the invention and its anticipated utility. Since then, further experiments on the constituents of the alloys have resulted in the determination of the form for use in gas lighting. In this particular, the experimental stage has been passed, and the correct composition ascertained. Baron von Welsbach has given an option in respect of the patents covering the invention; and the holders of that option have been, and are still, engaged in developing suitable mechanism for utilizing the metal in connection with gas ignition. The results so far obtained, it is understood, have afforded satisfaction to the gas experts who have seen tests; and a little display we ourselves witnessed some time since gave assurance as to the consistent sparking property of the alloys. Opportunities will, in the near future, be afforded to gas engineers in this country of practically testing both the alloys and the proposed mechanism.

The Mid-Oxfordshire Promotion.

The Mid-Oxfordshire Gas Company, as a letter before us plainly indicates, did not secure from the public all the capital asked for; and it is the public who are to be congratulated. The prospectus announced that the list was to close on or before Monday, April 9; and the letter before us is dated one day later (April 10), and five days after the Chairman of the Unopposed Bills Committee of the House of Commons had announced that he and his fellow-members had come "to the conclusion that the [Mid-Oxfordshire Company's] Bill must be adjourned for a time, as they considered the financial position of the Company was not such as to satisfy them that the measure should be passed." The dates mentioned suggest that the promoters of the Company, immediately the results of the issue of the prospectus were seen, were violently anxious to get in more money. We are quite prepared, as our readers are not likely now to be influenced by it, to give the letter of April 10 the fullest free circulation in our power. It runs—

8, *New Road, Oxford, April 10th*, 1906.

Re 5% Gas Debenture Stock, Redeemable at 7½% Premium.

Dear Sir,—I am desired by the Directors to inform you that there remains a small amount of 5% debenture stock unallotted, and that the Board propose to give the Stockholders the first opportunity of taking this up at par. I shall therefore be glad to hear whether you care to increase your holding, and enclose application form, which kindly fill up for the amount you may wish to secure, and return to me at your early convenience.

I send you herewith book of photographs and plans of the various towns in the Company's area, and also by book post a copy of the "Oxford Times," the leading county paper, which has an article on our gas undertaking which may be of interest to you.

(Signed) H. Banyard, Secretary.

We are under the impression that the recipient of the letter before us did not wish to "secure" any amount of this stock. Regarding the article in the "Oxford Times," the letter states that the paper contains "an article on our gas undertaking." We say that is a deliberate misstatement. The "Oxford Times" had an "article" (which was nothing more than a clever advertising *ruse*) which the Editor commenced by saying: "We have received the following article from an expert in gas production." Our journalistic contemporary has been duped if it was thought that the "article" was something original. The onus of proof of these statements rests upon us; but it is a light burden. The so-called "article" was written quite two years ago—long before, we should fancy, the scheme of the Mid-Oxfordshire Company was even in embryo. With the exception of two paragraphs, one acquainting the reader with the names of the bankers who will be pleased to receive their applications for stock and shares in the Mid-Oxfordshire Company, practically the whole of the other paragraphs of the "article" from "the expert in gas production" will be found on pp. 14-18 of a book issued, in the summer of 1904, by the Water and Gas Securities Company, Limited. It was the Water and Gas Securities Company who privately addressed letters to shareholders in other gas companies offering stock in the Mid-Oxfordshire Company before the issue of the prospectus.

The Attitude and Demands of Labour.

Recent speeches by Labour Members of Parliament show unmistakably that the party intend to make the best possible use of the opportunity they have obtained by the last General Election to bring their affairs under the notice of the Legislature—not in the form of suggestions, but as demands. Speaking at a meeting of the National Union of Gas Workers and General Labourers recently held at Merthyr, Mr. Will Thorne, M.P., is reported to have declared that employers were beginning to recognize the importance and power of Trade Unions, and to "cry for mercy." But he assured his hearers that the Labour Party were going to "take all they could get;" and he predicted that after the next election they would be represented in the House of Commons by "ten times the number of members who at present serve its interests." He went on to say that there are many men on both sides of the House who are utterly out of sympathy with the workers, and who are endeavouring to kill the Labour members with kindness. But the latter were "old birds," and not readily "caught by chaff." In an article contributed to the "Western Mail" by Mr. W. Brace, M.P., the Vice-President of the South Wales Miners' Federation, on the Workmen's Compensation Bill introduced by the Home Secretary, he stated very plainly that it would require a great deal of amendment before it could be looked upon by the workers as a "satisfactory measure." It must be acknowledged that the honourable member is one of the most fair-minded and intelligent of the leaders of his party; and the tone of his article is more moderate than that frequently adopted. For example, at the conference of the Independent Labour Party held at Stockton last week, a vote of sympathy with the victims of the Courrières disaster could not be passed, according to the reports, without an expression by the meeting of their "detestation of a system which makes sacrifices to capitalist greed."

What the catastrophe referred to has to do with "capitalist greed" is not very apparent. But the phrase is one that would be sure to be received with applause, regardless of its applicability, by the people to whom it was addressed. Concurrently with the increased demands of Labour, greater activity is noticeable in the spread of Socialism. Under the auspices of the "Clarion," the organ of the Socialists, a body of "Scouts" has been organized to propagate the doctrines advocated in that publication. At a meeting held at the Holborn Town Hall on Wednesday, Mr. J. R. Seddon, M.P., expressed the opinion that Socialism could be brought into our present government; and he said that proof of it was to be found in the municipal ownership of gas and water supply and means of locomotion, which had proved beneficial to the people. He is reported to have declared that "unless the present state of affairs was speedily altered, there would be not only social revolution but social annihilation." These remarks, taken in conjunction with the others to which we have called attention, are portents which employers of labour should not disregard. Nor should they be unmindful of the efforts of their Parliamentary Council on their behalf, as shown by the document noticed in our "Miscellaneous News" to-day.

The Italian Gas Society's International Competition.

In the "JOURNAL" for Oct. 24 (p. 239), we gave particulars of the prizes and subjects offered and chosen by the Italian Gas Society for the purposes of an international competition. We now learn from the Italian technical paper "Il Gaz," that only three papers have been sent in by the date specified—namely, the 1st ult. One of these papers is an English one, having for its motto, "Juvenis Brit." and for its subject, "Suggestions on Tar-Extraction, Condensation, and Scrubbing of Coal Gas." This was not one of the three particular topics chosen by the Society, but was permissible as being of interest to the gas industry. A German paper deals with the first subject suggested by the Society—namely "The Present Position of Affairs relating to Retort-Houses, and the Preference to be given to Horizontal, Inclined, or Vertical Retorts." The third essay is a French one, having for its title, "Electrolysis of Metal Pipes by Vagrant Currents coming from Electrical Systems." Signor Laeng, the Secretary of the Italian Gas Society, much regrets the absence of any Italian contribution; and our Italian technical contemporary comments on the very rare occasions on which any Italian gas engineers have contributed any account of their studies or investigations. The explanation suggested is that they are apprehensive of compromising themselves by any such communications. That such an attitude is not unnatural will be understood when the present state of affairs between gas companies and municipalities in Italy is borne in mind. Especially is this the case where the agreement between the two contains the frequent clause that the profits accruing from the adoption of any new methods in gas manufacture shall be shared between the company and the municipality. Notwithstanding the drawbacks of such a position, however, we also regret that Italian gas engineers have not played such a prominent part in general technical literature as have Italian electricians. Nevertheless, in our opinion, it is merely a question of time before we see gas technics in Italy taking their proper place in current technical literature.

The Disposal of Spent Ammonia Liquor.

Mr. Porter, a member of the Sutton District Council, at once deserves the thanks of those technically concerned in the operations of gas-works, and merits all the censure that has locally been poured upon him for having done his best (at a recent meeting of the Council) to reopen the healed disagreement that arose between the Council and the Gas Company some months ago regarding the discharge into the sewers of spent ammonia liquor from the sulphate plant at the gas-works—the effluent passing to the sewage beds, it is said, causing destruction of the bacteria. The Gas Company immediately evinced a desire to do all that lay in their power to remedy a condition of affairs over which the Council considered they had a just cause for complaint; and it will be within the recollection of readers that, in the "JOURNAL" for Dec. 26 last (p. 883), an article appeared briefly describing the action and satisfactory effect of a plant that the Company adopted (the invention of Mr. John Radcliffe, of East Barnet) for the purification of the effluent. Since then, the Farm and Sewage Committee, in whom the District Council have the fullest trust, have been on perfectly amicable terms with the Company, seeing that they have not had the slightest ground for further complaint. The Committee, in fact, were taken into full confidence by the Company, who interested the members both in the effluent purication plant and the gratifying manner in which it has answered its designed purpose. The members at the Council meeting and the Local Press have given utterance to their feelings regarding Mr. Porter's indiscretion in attempting, in opposition to the satisfaction of those who are responsible, to throw doubt upon the effectiveness of what has been done, and to ruffle the rehabilitated friendly relations between the Council and the Company. However, technical interest in the incident is centered in the statement of one member that the sewage-beds are now working satisfactorily, and that is what the Council have been striving for; and of the Chairman, that there was a deleterious effluent from the Company's works found in the beds at the farm, but the Company have stopped it. Since then the Council have had no occasion to complain.

Patent Law Amendment.

The patent law of the United Kingdom, it is obvious to all who are in touch with inventions, as originators or commercially, requires amendment, not only in one but in several ways, with which they are all only too well acquainted. The other day the President of the Board of Trade received two deputations—both on a like errand, but apparently with different ultimate objects—one representing patentees, and the other, as representatives of the Association of Chambers of Commerce, the great commercial and industrial sections of the country. The point that was raised before Mr. Lloyd-George was a simple but important one. The representatives of commerce asked for legislation which would enforce, in the United Kingdom, the forfeiture of all British patents for inventions which were worked without, but not within, the the United Kingdom, after the lapse of three years from the date of application in the country of origin, unless the patentee could justify his inaction to the Board of Trade. A sympathetic reception was accorded the deputation by Mr. Lloyd-George, who quite agreed that the amendment of the patent law was of urgent importance to commerce and the industry of the country. There are arguments to be adduced on both sides of the question of amendment as raised by the deputation from the Chambers of Commerce. There is the case of the poor foreign patentee who cannot get anyone to purchase his British patent rights. It is true that the Patent Act of 1902 does not provide for compulsory working, but only for compulsory licences. It may, however, be taken for granted that if a patentee's invention is one of real utility, he will not be long before he is able to get all the financial assistance he requires; if, however, he should not be in a position to do this, and the invention is not worked in this country, those who desire to exploit it here have at command that very convenient process of compulsory licence. If any amendment, however, is made, some way should be found to give such patentees full protection. But there is the other side; and it is to this one that the deputation were directing their attack. A patent is (as was said on the occasion) a monopoly granted by the State. It is granted for an adequate consideration; and the State is entitled to demand that the adequate consideration shall be given. But when a patent is granted to a foreign inventor in this country, and he uses it only as a protection to goods made to the specification in another country, and then sent to this one for sale, then the State does not receive the adequate consideration that it has a right to expect. That is the point; and the object of the suggested amendment is to help to the extension of new manufactures in this country. We have to wait to learn whether the representations laid before Mr. Lloyd-George will bring about the necessary change.

Purification Results.—Mr. H. Kendrick, of Stretford, writes: "I am not disposed to enter any further into correspondence with Messrs. S. Cutler and Sons with reference to the merits of the various 'lightening' grids now on the market, as, unless my challenge is taken up, I cannot see what benefit it will be to your readers. Messrs. Cutler are not alone in considering their patent grids to be the best on the market; I have letters in my possession from other makers making the same claim. All I have claimed is that, by the use of one of the new systems, I have increased the efficiency of my purifiers 100 per cent. under my working conditions; and with this I am satisfied for the present. But I am expecting to increase the efficiency by 200 per cent. or more before I have finished."

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 251.)

We noted last week that when the Stock Exchange closed on the day before Good Friday, the outlook, so far as one could forecast, was favourable, and pointed towards better business upon reopening after Easter. On Tuesday business was resumed; and, although the attendance was as yet very scanty, there was a cheerful tone, and the promise of the previous week seemed likely to be realized. But before this could take a firm hold, the catastrophe at San Francisco fell like a bolt from the blue, and completely changed the situation. Gilt-edged securities were largely sold, in view of probable realizations by Insurance Companies; and the shares of the latter were almost thrown on to the market. In all probability it will very soon be seen that the panicky state of things was unreasonably exaggerated; but for the time being down came the prices with a run. The Money Market was decidedly tight. There was a brisk demand, and the supply was short—a position which was to a great extent the result of withdrawals on Japanese account. The situation was further aggravated by anticipation of large displacements on American account. Business in the Gas Market was very quiet, and quite devoid of any changeful feature. Wherever there were any dealings, the prices were almost entirely free from any movement. As for quotations, there was only one change in all the London list, and one each in two of the Provincial Exchanges. These, however, were in the upward direction, and helped to illustrate the general firmness. In Gaslight and Coke issues, there was a very moderate array of transactions, and the figures ranged from 98¼ to 99⅛. The secured issues were very little dealt in. The maximum changed hands at 88¾; the preference at 110; and the debenture at 88½ and 89. South Metropolitan afforded a few dealings, and prices marked showed a range of from 127½ to 128½. There was one transaction in the debenture at 89. Commercial was not much dealt in, but the prices were good. The 4 per cent. changed hands two or three times at from 115½ to 115¾; but there was no business in the 3½ per cent. or the debenture. The Suburban and Provincial group were very little dealt in. Bournemouth "B" was done at 17⅞, Hastings 3½ per cent. at 102 special and 100, South Suburban at 122 and 122½, and West Ham preference at 123½ and 125. Among the Continental Companies, there was moderate dealing in Imperial, at prices which rose from 235 on Tuesday to 237½ on Friday and Saturday—a rise of 1 in the quotation. The debenture stock was done at 96½ and 97. Union was done at 131, and European fully-paid at 23⅜. Among the undertakings of the remoter world, Primitiva ordinary changed hands at 7 3/16, ditto preference at 5½, and ditto debenture at from 98½ to 99. River Plate marked 13⅝ and 13½, and San Paulo 14⅜.

The closing prices are shown in our Stock and Share List on page 251.

ELECTRIC LIGHTING MEMORANDA.

Fires and Electricity Installations—Unenforced Regulations—Compliance only a Partial Protection—The "Reliable" Witness of the Town Clerk of Sydney again Impugned—The Control of Lights to Secure Economy.

When electricity and fire are mentioned in conjunction in any section of the Press other than their own, there is a wonderful bristling up in the editorial offices of our electrical contemporaries, and indignation drives along the pens in the futile attempt to refute facts. With great gusto a few weeks since, the "Electrical Review" quoted from the annual report of the Fire Brigade Committee of the London County Council, to show that there were fewer fires caused last year by electricity than by gas in the Administrative County of London. But a fortnight since, referring to the remarks of the "Review," it was proved, in the "Memoranda," that the fires occasioned by electricity were, in proportion to consumers, greater in number than those produced by gas. Our contemporary has not yet seen fit to deny this; and perhaps greater reason will be seen for not doing so after reading the evidence given at the inquiry last Wednesday into the circumstances of the fire, at a bookbinding factory at St. Andrew's Hill, City, on the 3rd inst.

In the City alone, there were in 1904 twelve fires caused by defective electrical apparatus; and in 1905, the same number. Dr. Waldo, the City Coroner, gives it as his opinion that more accidents of the kind happen than come to light. Superintendent Smith, of the Metropolitan Fire Brigade, also states that it is suspected that a good many fires of late years have been due to short-circuits; and Mr. R. F. Stubbs, one of the Electrical Inspectors to the London County Council, asserts that he has known of a good many fires which were undoubtedly due to careless workmanship in fitting electrical apparatus. It is somewhat idle, in view of these statements, for electricians and the electrical journalists who have had no connection with the fires as have these witnesses, to speak of exaggeration. In the case under investigation, the jury could not agree that the cause of the fire had been determined by the evidence; but they were fully satisfied that the electric installation—the factory machinery was operated by an electric motor—was defective. Every effort was made to trace another probable cause for the conflagration. The inevitable cigarette was brought into prominence; but gas is clearly exonerated, seeing that one of the employees, having noticed a smell of gas, had turned off the meter on the ground floor "previous" to 6.40 on the evening of the fire, and the premises were not locked up until 7 o'clock. Electricity has no such protective smell; and its danger is not realized until it is upon one. The evidence of those witnesses who knew anything at all about the affair pointed to a defective circuit; but the installation inspector of the City of London Electric Light Company was of a contrary opinion. At which no one will be in the least surprised.

When, however, there is no side way by which the blame for a fire can be fastened on to something else than electricity, then it is always found—by the electricians—that in some manner or other the Board of Trade regulations for installation or the suggestions of the Institution of Electrical Engineers have not been fully complied with. It was so stated in this case; so that if the smoking of cigarettes as the cause of the fire fails to find favour, then neglect to comply with the recognized regulations in installing the electric motor may be accepted as an alternative. Readers may take their choice, as the jury left the matter an open question; but it will be observed that the latter appended to their verdict a recommendation that the regulations for the fixing of electrical apparatus should be in accordance with the conditions framed by the Institution. It is not clear that the jury possessed any special qualifications for deciding the question as to whether the Institution's installation rules are perfect, and therefore worthy of the fullest commendation. But it is not very unusual for juries to take upon themselves peculiar responsibility. Clothed with brief power, they will often go where angels fear to tread. However, though there are codified installation conditions, there is no machinery for seeing that the conditions are complied with, or for compelling compliance. If there were, less would be heard of these troubles. But, however great the care, all danger would not be eliminated. Instances of incipient trouble (repressed only by prompt measures) come within our own private circle. In these instances, we are aware, the charge of cheap-and-nasty installation will not lie, although even electricians and contractors, judging from estimates and tenders for electrical installation work that are constantly being published, do not appear to have any very clear conception as to what are fair prices. It is not an infrequent thing to find the top price double and even treble the bottom one. The character of the electrical work put into mills has been the subject of comment in the "Textile Mercury;" two fires of a "very serious nature that have recently occurred in Lancashire mills" having moved the Editor to give mill managements a little sound advice. According to the Editor of the paper referred to, it seems the practice in making electrical installations in mills to leave it very much to chance or to architects who, however clever they may be in other respects, are not as a rule competent electricians. The result is that the lowest tender is accepted; and, there being no proper supervision, trouble—and most serious trouble sometimes—is the result.

Turning from private and factory installations to public supply installations, if regulations and specialized training could positively obviate trouble in electrical installations, then surely there ought not to be so much difficulty as there is on electricity distribution systems. We recently referred to a case, in which the whole of the occupants of a house in Green Street, Upton Park, narrowly escaped death through the noxious fumes arising from the fusing of an electric cable; and the Engineer of the East Ham Electricity Department (Mr. Ullman) did his best, through a representative of a local paper, to discredit gas in connection with the occurrence. In the same paper for the 14th inst., we find this paragraph—

> On Monday morning tradesmen living near No. 422, Katherine Road, found the pavement had become very hot through the fusing of an electric cable underneath. The police were informed; and they at once telephoned to the East Ham Electricity Depôt. Workmen were soon on the scene; and the trouble was put right.

The greatest surprise about the matter is that Mr. Ullman has not on this occasion contrived to wriggle gas into the occurrence. We suppose the East Ham system, seeing that it is a product of the present century, was constructed in the manner most approved by latter-day electricians. Yet there is trouble. But it comes to this, that regulation, expert suggestion, and specialized training where electricity is concerned will not assure one of safety, though all these things undeniably contribute to it. We are told by an electrical contemporary that at Bridgwater the Electricity Company have issued a pamphlet, which contains (on two pages) a collection of gas accidents "as an awful warning to those who do not use electricity." If gas people are so minded, it would not be difficult for them to collect a few "awful warnings" to those who do use electricity, regarding its mysterious and mischievous workings. A beginning could be made by reference to this week's electrical papers—quoting the case of Harry Jenkins, who was killed by electric shock while trimming electric arc lamps; and Tynemouth, where a "slight mishap" to a machine cut off the public electric lighting for an hour.

Mr. T. H. Nesbitt, the Town Clerk of Sydney, must be, by this time, heartily sick of having allowed his zeal for electricity to outrun his discretion. If he is not, then he does not suffer from any ordinary human sensitiveness. His position as Town Clerk

has not served as a palladium against criticism and exposure. He has been convicted of having, in the series of articles that he contributed to the "Sydney Daily Telegraph," committed literary piracy, of appropriating as his own, without acknowledgment, published statements, and of giving misleading information to readers of his articles under a veneer of verisimilitude. All this was shown in the "Memoranda" published on March 27; and now, supplementing the correspondence evoked by the Town Clerk's articles which we had previously seen, there comes to hand a letter published in the Sydney paper from Mr. John Hinde, the Secretary of the Metropolitan Gas Company of Melbourne, in which further of the misrepresentations are laid naked. Among other things, Mr. Nesbitt stated that, as the result of the introduction by the City Council into Melbourne of the flame arc lamps, "in under two years there was not a single Lucas lamp in the city streets, where electricity was available." It is only natural that, in the vacillations produced by competitive business, flame arc lamps should for advertisement display displace gas-lamps, and that gas-lamps should also displace electric lamps. That is precisely what has happened in Melbourne; and Mr. Hinde discloses the unreliable character of Mr. Nesbitt's information when he states the fact "that we have in Melbourne and suburbs a greater number of Lucas lamps in use at this date than we had when the City Council first brought out the flame arcs, and in nearly every case 'in streets where electricity is available.'" Mr. Nesbitt is again brought to book by Mr. Hinde. The Town Clerk gibed at the "JOURNAL" as a source of reliable information on these matters, and hoisted high the "excellent authority" and "reliable sources" which he himself had at command. The "excellent authority" on which he relied for news as to happenings in Melbourne did not know the difference between the "Lucas" lamp and the "Millennium" high-pressure system. The latter system was installed by the Metropolitan Gas Company outside the cathedral in Melbourne; and it was immediately challenged by the City Council withdrawing flame arcs from another part of the city and erecting them within a few feet of the new gas-lamps. Mr. Nesbitt promulgated in Sydney what was news to the Melbourne Gas Company, that they had become "disheartened and discouraged, had removed the lamps, and had given up hopes of successfully competing with flame arc lamps." The fact is, Mr. Hinde states, the "Millennium" lamps have been allowed to remain, are lighted nightly, and exhibit, according to disinterested parties, as effective an illuminating effect, if not a better, than the flame arcs of the Council—at any rate, the steadiness of the gas-lamps, compared with the flickering of the flame arcs, is apparent to anyone. This is also the experience with the flame arcs and the high-pressure gas-lamps at Blackfriars Bridge and the Mansion House in the City of London. It was a slender reed that Mr. Nesbitt depended upon for support when he obtained his batch of misrepresentation and untruth from Melbourne. The use of such statements must in the end do more harm than. good to the cause in whose interests they are employed.

There have been opportunities lately of directing attention to the loss suffered by the user of incandescent electric lamps—partly through his own fault, partly through want of reliability of the lamps he buys, partly owing to erratic voltages, and partly due to the facility which this means of illumination gives not only for saving but for waste. The very ease with which the light can be switched off enables it to be switched on, and left on by those residing under the same roof as the man who has to pay. Among the references to this subject, one has appeared (March 20) that was suggested by a paper recently read by Mr. George Wilkinson, of Harrogate; and the paper has also inspired a special article in the "Electrical Review." The article was evidently written for editorial adoption; personal pronouns plural being fairly well sprinkled throughout. But apparently some of the views were a little too heterodox for editorial acceptance; and so the "we's" and "ours" were allowed to stand, with the protective word "Communicated" under the heading. This article does not deal directly with Mr. Wilkinson's paper; but its intention clearly is to carry the well-worn subject of waste in incandescent gas lighting beyond that gentlemen's statement of the openings for uneconomical lighting that he finds in incandescent electric lamps. That there is a "beyond" is a confession and a matter for the consideration of the householder contemplating the use of incandescent electric lamps. Mr. Wilkinson, says this writer, set out to limit his remarks to lamp efficiency and graded candle powers; but "this is only touching the fringe of the whole subject of waste in incandescent electric lighting." Obviously, then, waste in incandescent electric lighting must be a large subject indeed. The consumer, this frank writer further remarks, may be supplied with the most perfect lamps, but these will not enable him to run his installation economically, or cause his bills to compare favourably with those of his neighbour who uses gas. Quite true! "As we think," continues the article, "it is agreed that every station engineer's aim and duty is to compete with gas; and to do so successfully, if any further large increase in electricity supply is to be expected, it is at once evident there is much more to be done besides guaranteeing efficient lamps. The consumer has to be educated if electric lighting is to make any further appreciable inroads on gas." The writer, in more words than we can find space for, goes on to advise first that the station engineer should obtain the confidence of the consumer; and then a flat price must be adopted as being the only method of charging by which the consumer can know where he is. Advice must follow on matters of economy—such as the wiring of premises, lamps to be used, and so on; and a clearly written pamphlet should be supplied. The consumer should also be advised to have between the main switch and the point switches, control switches, assembled where the householder can get at them to put in darkness all bed-rooms not in use, and the rooms occupied by servants who exceed their time-allowance in getting into bed. We can picture paterfamilias—before putting his control switches into operation, and bringing the wrath of the whole household upon him for his niggardly ways—crawling round to ascertain if the occupants of the rooms had gone to bed. Perhaps, however, it would be better to have a curfew bell as an accompaniment of such a system. Then the writer advocates more point switches at each door, so as to render it impossible for the occupant of the room to use more lights than the householder, according to his parsimony or otherwise, deems necessary—in short, everything should be done to secure the use of the minimum number of lamps. Then the station engineer should raise his voice against the use of artistic fringes and shades, so beloved of the housewife, which assist in beautifying but cause faulty illumination, and consequent waste. The station engineer would not raise his voice a second time in this cause if he heard a few of the comments on his conduct the first time. But so we go on, until, wearied, a few words of thankfulness escape the lips that the incandescent gas-burner gives a light so cheap that it is unnecessary for the user to vex himself about all these minute savings, or to have any amazing system of control (all adding to the initial cost) installed in order to guard himself against his own family, friends, visitors, and dependents.

Calcium Carbide and Fire.

We have received from the Secretary of the Acetylene Association a reprint from the current number of the "Acetylene Journal" of some official reports on the above subject. They show the non-liability of carbide of calcium to cause fire. On Oct. 30 last, a fire broke out in the warehouse of the Chattanooga Transfer Company, Tennessee, owing to the overturning of a lantern. The building contained about 700 drums of calcium carbide; and though the fire had gained headway before the firemen arrived, only five of the drums burst, and no explosion resulted from the throwing of water on the fire. In his report on the conflagration, the Chief of the Fire Department (Mr. H. A. M'Quade) said he was in the building when it was at its fiercest point, and the flames were rolling all over the carbide. Had this been an explosive matter, it surely would have caused the total loss of all the building and contents stored therein. He added: "This clearly proves to me that when carbide is stored in a well-ventilated building, there is no danger whatever to be had from it in case of fire, though I may state it would not be wise to store any explosive in the same building." The Transfer Company, in course of their report to the owners of the carbide, said: "Notwithstanding the fact that there were two or three heavy streams of water poured continuously upon the drums for an hour or more, they were uninjured, and were delivered to customers the next morning. Not only ourselves, but the entire Fire Department and the insurance men, were utterly amazed at the result; and the facts remain that all anxiety in regard to danger of this material in causing disastrous fires is absolutely removed." After the fire, two drums of carbide that had been exposed to the flames were opened, and their contents were found to be uninjured.

Coal Testing in America.

We learn from an article in a recent Engineering Supplement to "The Times" that the United States Government has decided, with the sanction of Congress, to continue the work of testing the coals and lignites of the various States. This work, as our readers may remember, was commenced during the holding of the St. Louis Exhibition, under the supervision of the Director of the United States Geological Survey. Congress has made the necessary appropriation for the present year; and it is probable that the testing of coal will become one of the permanent duties of the department named. The mines are sampled under the rules prescribed by the Geological Survey and the American Chemical Society. A preliminary report has been made, some of the conclusions of which are as follows: (1) When coal is converted into gas and used in a gas-engine, its average efficiency for power purposes is from 100 to 150 per cent. greater than when it is used under boilers. (2) The poorer grades of coal, rated according to their steam-raising qualities, give better results in the gas-producer than the higher grades of steam coals. (3) Lignites used in the gas-producer are, in power-raising efficiency, equal to or even better than steam coals used under boilers. (4) Many coals high in sulphur or ash can be materially improved for steaming, coking, or briquette making purposes by washing. (5) Some non-coking coals can be made to produce a fair quality of coke by an addition of coal-tar pitch to the charge of coal. A comparative statement of some of the results obtained at the coal-testing plant in the generation of power by the boiler and steam-engine, and by the producer and gas-engine shows a saving in favour of the latter method (eliminating any possible differences of cost of installation and of operation) of more than 50 per cent. in every instance; and in one case the amount of coal consumed per horse-power-hour by the boiler plant was nearly three times that used in the producer.

THE SLIDING-SCALE PROVISIONS.

An American View.

THERE has just been published in Boston an elaborate report by a Committee which was appointed last year by the Massachusetts Legislature to "consider the automatic and interdependent adjustment of the price of gas to consumers, and the rate of dividends to stockholders of gas companies, under what is known as the London sliding-scale, with special reference to the expediency of applying that scale to the Gaslight Companies in the City of Boston and the Town of Brookline." This Committee consisted of the existing Board of Gas and Electric Light Commissioners (three in number) and two others. A majority of the members visited this country last year, and made most careful inquiries in London and elsewhere; and this report is the result.

It is significant of American methods that the report commences with a sketch of the history of the London Gas Companies from the earliest times—viz., from the granting of a charter to the Gaslight and Coke Company in 1812—and the relations of these Companies to Parliament and the public prior to the introduction of the sliding-scale provisions in 1875. This sketch contains much that is new to many of the present generation of British gas men. Among other things, it reveals the origin of the 10 per cent. maximum dividend, which in time came to be regarded as the statutory rate of dividend on all capital originally expended; and it shows that all methods short of actual coercion had been tried for the regulation of the Companies in the public interest. Only after the failure of the revision clauses contained in the Acts of 1868 and 1869—resulting as these did in startling increases in the price of gas supplied by the Chartered and Imperial Companies, after the coal famine of 1872—were the sliding-scale provisions resorted to. "Clearly," as the report says, "the Act of 1868 had utterly failed to meet the expectations of the Committee of 1867, and, as a device for regulating the Companies in the interest of the consumers, had completely broken down." Yet this was, in effect, the very power of revision which continues to be relied upon in America for controlling the price of gas, and which, as appears from their report, is favoured by the majority of this Committee.

The report deals at some length with the introduction of the sliding-scale, its subsequent history, and the modification it has undergone as a result of the inquiry of 1899, and refers also to the movement for the conversion of stock, which, although not commenced by the South Metropolitan Company in 1896, nevertheless received a great impetus from the example of that Company. A comparison is instituted between the prices of the Companies working under the maximum price and maximum dividend in 1903 with those working under the standard price and sliding-scale in the same year. From this, it appears that the average price of gas per Company for the former class was 3s. 10·09d; and in the latter class 3s. 5·87d., or, omitting the three London Gas Companies, 3s. 5·97d. Confining the computations to the Companies in each class selling 100 million cubic feet or more, in the former class there was an average price per company of 2s. 8·8d. per 1000; and in the latter class, not including the London Companies, of 2s. 10·5d. Comparing the progress between 1880 and 1903 of all the Companies (48) under the maximum-dividend system with all the Companies (17) which had the sliding-scale for that period, it was found that the average reduction per Company in the former class was 7·77d., and in the latter class 11·18d. The Committee, however, draw no conclusion from this somewhat significant circumstance, in view, they say, of the widely varying conditions of the Companies. They indeed express a doubt as to whether anything has contributed so effectively to the reduction of prices as the compulsory sale of stock by auction. As to this, the report states that "the importance of this method of issuing new stock to which a maximum divided was attached, seems to have had little or no recognition until 1853, when it was applied to the Bristol and Nottingham Companies." It would have been more correct to say that such importance became apparent almost, if not quite, as soon as the principle of maximum or authorized dividends was established. That the auction clauses coupled with extended borrowing powers have largely contributed to the reduction of prices is beyond question; but exactly to what extent there are no means of determining.

Passing from these matters, the report proceeds to relate the the history of the gas industry in Massachusetts, commencing with the establishment, by Special Act, of the Boston Gaslight Company in 1823. Some 38 other Companies were chartered by Special Acts prior to the enactment of a general law in 1855, under which ten or more persons, upon complying with certain conditions, might become incorporated and receive a Charter as a Gas Company, without other legislative consent. It appears that prior to 1885, these Companies possessed over other joint-stock companies no powers or privileges, except that they might, "with the consent in writing of the mayor and aldermen of a city, or the select men of a town, dig up and open the ground in any of the streets, lanes, and highways thereof so far as is necessary to accomplish the objects of the Corporation." Moreover, all legislation since the General Act of 1855 is stated to have been restrictive as regards gas undertakings rather than expansive in its character. For example, "in 1861 standards were fixed for gas-meters, and for the purity and candle-power of gas, and ample provision was made for the examination of all meters, and of the gas of all the companies by competent State officers."

In 1885, the Board of Gas Commissioners—now known as the Board of Gas and Electric Light Commissioners—came into existence. The Act prescribing the duties of this Board provided that they "shall have the general supervision of all corporations engaged in the manufacture and sale of gas for lighting and for fuel, and shall make all necessary examinations and inquiries, and keep themselves informed as to the compliance of the several corporations with the provisions of law." They were further authorized, "upon the complaint in writing of the mayor of a city or the select men of a town in which a gas company, is located, or of twenty customers of such company, of the quality or price of the gas sold by such company," to order, after a public hearing of the parties, "if they deem just and proper, any reduction in the price of gas, or improvement in quality thereof." The Board were also constituted an Appeal Court against the decisions of the local authority upon the question of the admission of a second company into a city or town where a company was already established. Further powers were vested in the Board a year later; and in 1887 authority was given them to authorize gas companies to supply electricity for light and power. In 1894, an Act which was passed in 1873 requiring all sales of new stocks by gas companies to be by auction, was repealed, and no new stock was permitted to be issued, except with the approval of the Board of Commissioners. The companies were required to offer such stock first to their own shareholders, "at not less than the market value thereof," to be determined by the Commissioners, after "taking into account previous sales and other pertinent conditions."

From the foregoing will be seen how extensive are the powers vested in this Board of Commissioners, and how inquisitorial and harassing to the Companies are their functions. Whether their jurisdiction has resulted in real benefit to the consumers of gas is, perhaps, another story. The report says that "the formal requests to the Board for reductions in price have not been numerous, but the policy of the Board, as indicated by the reasons given for their decisions, the exhibition of the affairs of all the Companies and the strong desire on the part of most of them to escape the public criticism incident to each application, have proved an effective stimulus to increased economy of administration, and an inducement to frequent voluntary reductions of price." It is further stated that, whereas in 1885 there were in the States 57 companies charging an average price of $2·41 per 1000 cubic feet, these prices averaged, at the date of the report, $1·48 per 1000 cubic feet—a reduction of 38·6 per cent. If the comparison be restricted to companies now selling upwards of 100 million feet per annum, the average reduction since 1885 has been 46 per cent.

Competition among gas undertakings, though not discountenanced by the Legislature or by the powers vested in the Board of Commissioners, has been of rare occurrence, and without importance, except in the case of Boston. Here, by the close of 1874, there were no fewer than eight companies supplying gas; but each had its own district, clearly defined either by its charter or by agreement. For the next ten years, all these companies maintained their independent existence with widely different prices—the result being widespread dissatisfaction. In 1883, however, and prior to the creation of the Gas Commission, authority was given to the Bay State Gas Company to lay pipes in all the streets of Boston, and to compete with other companies—following upon which this new Company proceeded to absorb certain of the other companies. Further financial operations succeeded, the result of which was to secure to the Bay State Company control over the Companies remaining nominally independent, while a large issue of bonds gave the promoters of the scheme a substantial profit. Public discontent, however, found frequent expression in the Legislature, though without result. But in 1893, upon a petition from the Mayor of Boston, a reduction of price was ordered from $1·30 to $1 per 1000 feet.

Competition, however, was again invoked. In the same year the Brookline Gaslight Company extended their mains in the districts supplied by the Boston and Roxbury Companies; while in 1896 a Special Charter was granted to the Massachusetts Pipe-Line Gas Company, with large powers for amalgamating with other companies. The restrictions as to price imposed upon this Company made it, however, impossible for them to compete with other companies; but in the following year the New England Gas and Coke Company acquired all the shares of the Pipe-Line, Brookline, Dorchester, and Jamaica Plain Companies. Thus the supply to Brookline and the whole of Boston, excepting two districts, fell into the hands of two groups, combined for many purposes, but preserving their separate corporate existence, while at the same time ensuring to each its separate rights and privileges. Thus, after the completion of the works of the Gas and Coke and the Pipe-Line Companies, the former began to sell all its available gas to the latter; and the Pipe-Line Company sold either directly or indirectly to all the others. These abnormal and complicated arrangements aroused suspicion that consumers were not being fairly treated, and that extravagant profits were being made. Appeals for redress were vainly made to the Legislature; and in 1899 the Commission presented a scheme for the consolidation of the Companies, but no legislation followed. The agitation, however, continued; and in 1903 the Boston Consolidated

Gas Company was incorporated, with authority to take over, under the supervision of the Commission as to the amount of capital, all the Companies in the two groups named, except the New England Gas and Coke Company. Simultaneously, financial difficulties overtook the Bay State Company, whose bonds, issued soon after its formation, were defaulted and foreclosed; while the New England Gas and Coke Company were compelled to reorganize or reconstruct. In consequence of these events, the control of both groups of Companies became vested in the Massachusetts Gas Companies, an unincorporated voluntary association or trust, which has also controlled the Boston Consolidated Gas Company from its commencement.

Finally, out of this almost incredible—not to say discreditable—entanglement, in which the gas consumers appear to have been but pawns in the great financial game, emerged the Boston Consolidated Company. This in 1905 took over all the Companies named in the Act of 1903, with a capital fixed by the Legislature of $15,124,600, and a price for gas of 90 c. per 1000 cubic feet, to take effect within one year after the completion of the consolidation. This is equivalent to nearly 3s. 9d., which, for a sale of over 3000 millions annually, is much higher than it ought to be. The same remark is applicable to the capitalization, which is at the rate of about £1000 per million cubic feet sold. With such an outcome of the present system of control, it is hardly to be wondered at that there should be a desire for a better way, which found expression in the appointment of this Committee.

The report continues with some observations upon the bearing and probable effect of the sliding-scale, which is declared to be of no value whatever if applied to a company who, for any reason, have a settled policy to pay no more than a certain dividend which they may be already earning. This is no doubt true; but it must be recollected that there is no policy so "settled" as to be inalterable, especially when higher dividends are in view. Even to the most conservative of sliding-scale companies comes, at some time or other, the not altogether unpleasing task of increasing the rate of dividend. It is further remarked that it is important to consider, in applying the sliding-scale to any company, "whether the price may not have already reached a point where further reductions may be dependent upon the increase of consumption in a greater ratio than the increase of capital—in other words, whether such economy on the company's operations may not have been attained that a reduction in price may be chiefly possible through a reduction in the capital charge, the amount of which will depend in part upon the activity of the management, and in part upon the general increase of population, and an improvement in its financial position." In this observation may be recognized a degree of conservatism sufficient to satisfy the stoutest adherent on this side of the ancient system of "maximum dividends." It paves the way to the suggestion that "certain causes," which "have operated powerfully to reduce the prices of companies in this State," are still operative; and although the same rate of reduction in the future as in the past cannot, in every case, be expected, yet "that, with changing conditions and increased business, further reduction may be made, we have no reason to doubt."

The report concludes lamely enough, by pointing out that, "to adopt the sliding-scale here, certain fundamental principles, in which the present laws and policy of the Commonwealth rest, must be abandoned." It is signed by three out of the five members of the Committee—the three constituting the Board of Gas and Electric Light Commissioners. These may or may not have seen their occupation menaced by the adoption of the sliding-scale; but it is certainly allowable to suggest that the finding of a Committee all the members of whom were entirely independent of the Gas Commission would have inspired greater confidence.

This objection to the composition of the Committee—which we conceive to be well-founded—is accentuated by reference to the second, or minority report, drawn up and signed by the two members of the Committee who are not members of the Gas Commission. Their report commences with the statement that the reporters are unable to concur with their associates on the Committee, and that, from their investigations and study of the gas situation, they are convinced that the sliding-scale system has worked well in England, and is also adaptable in Massachusetts, particularly in the conditions now existing in the City of Boston. The report runs:

> We consider that our duty is not fully performed by the recital of certain facts relative to the history of Gas Companies in Great Britain. We understand it to be our duty to report to the General Court as to the expediency of applying the sliding-scale system to gas companies in this Commonwealth, especially in Boston and the town of Brookline. We therefore . . . recommend the enactment of legislation for the adoption of the sliding-scale system by Gas Companies in Boston and Brookline. . . . We believe that the partnership principle of participation in profits and losses by the Companies and consumers, upon which the sliding-scale system rests, has proved an inducement to the Gas Companies in Great Britain to manage their business prudently, skilfully, and economically, resulting in more progressive and careful business methods, more judicious and economical expenditure of money, greater diligence in the profitable disposition of residuals, and a safer rate of dividend to the stockholders, than any method before known in connection with the gas business in that country; and that it has surpassed all others in establishing respect and confidence between the Companies and their consumers and employees in London. We would confidently anticipate results following its adoption and operation in Boston that would prove beneficial to the manufacturers and the consumers of gas, and to the employees of the Companies, and thus establish greater harmony than has heretofore existed between them.

These vigorous and emphatic sentences are in refreshing contrast to the halting and uncertain opinions expressed in the majority report; and they carry conviction with them. The report goes on to present more in detail than was done by the majority report, the consideration leading to the adoption of the sliding-scale in Great Britain and Ireland, and the results which have followed its establishment. It gives, in fact, a complete history of the sliding-scale, commencing with the address of Mr. (now Sir) George Livesey in 1874 to the British Association of Gas Managers. The parliamentary investigation of 1899, by which the principle of the sliding-scale was confirmed, occupies a large share of attention. The opinion is expressed that the conclusion reached in that investigation commendatory of the sliding-scale system, is confirmed by comparisons, based on "Field's Analyses" [?] of all the companies in England, between the sliding-scale companies and companies working under the maximum system; the comparison establishing—

(*a*) That the sliding scale companies, on an average, sell gas at a lower price than do the latter, and pay larger dividends to the stockholders.

(*b*) That the sliding-scale companies (excluding the Metropolitan Companies in this comparison, on account of their size) produce more gas, and do more business than the maximum companies—to wit, the average quantity of gas sold per company by the maximum companies, employing an average capital per company of £70,894, is 118,528,000,000 cubic feet; and by the sliding-scale companies, employing an average capital per company of £73,429, is 152,628,000,000 cubic feet.

(*c*) That the average rate of reduction in the price of gas of the standard or sliding-scale companies, when fairly in operation, has been greater than that of the maximum companies.

The report proceeds to consider the application of the sliding-scale to Massachusetts, and particularly to Boston. With regard to the former, it is suggested that "the Massachusetts system of supervision by the Board of Gas and Electric Light Commissioners, and of publicity, as well as the provision for preventing stock-watering, is undoubtedly of great value, and these provisions should be fully maintained. But the provision for the compulsory reduction of price has not in our opinion proved adequate to secure for the public gas at low prices." It recognizes that no single standard price or standard dividend can be justly applied to all companies, and proposes that these questions, together with the ratio of increase and decrease of dividend rates shall be determined in each individual case by the Board of Gas and Electric Light Commissioners, after public hearing. In regard to Boston, it is observed that, during the 20 years preceding the Act of 1905:

> The conduct of the gas business in Boston had been a source of almost constant complaint on the part of its citizens, and for such complaints ample cause existed. During a large part of the time, at least, the interests of the public rarely received reasonable consideration. Speculation and selfish interest seemed to control the action of the companies. Suspicion of fraud and corruption, often well founded, was associated in the public mind with the financial and legislative operations of the companies. . . . During a large part of this period, the efforts of the managers of the several properties were devoted largely to furthering improperly selfish schemes, or in repelling attacks upon the companies. Investigations, or attempts at investigation, by the Board of Gas and Electric Light Commissioners and legislative hearings followed in rapid succession. Little thought was given to perfecting and developing the business of making and distributing gas, and practically no reductions in selling prices were made, except as an outcome of petition and hearing.

As the result, the capitalization of the Boston gas plant is abnormally high, as compared with other cities; and the increase in the sale of gas has been unduly small. A table giving the capitalization and gas sales relating to Boston and five other large Massachusetts cities, shows the capitalization of the former in relation to sales to be two-and-a-half times as much as that of any of the latter; while the gas sales in Boston the last three years show a falling off. Testimony is, however, borne to the improved management which has followed the establishment of the Boston Consolidated Gas Company, which, the report states, "has given evidence of ability, and of desire to serve the public as well as the stockholders; and this great change in the character and attitude of the managers of the business is rapidly winning the confidence of the consumers."

In the opinion of the reporters, the present conditions afford an excellent opportunity of testing in Massachusetts the value of the sliding-scale system, which they recommend should be applied to the Boston Company, with a standard price of 90 c., and a standard dividend of 7 per cent.—increasing 1 per cent. for every 5 c. reduction in price. This proposal is much more liberal than the scale which obtains in this country, where a 7 per cent. dividend is usually made, subject to an alteration of 3s. 6d. per cent. for every 1d. alteration in price; and it would probably be the means of largely increasing the dividends of the Company. But, as pointed out in the report, "the aim of the public is to get good quality of gas at a low price, and not to prevent the stockholders from obtaining large returns. The community should be willing

to let the stockholders earn 10 per cent. if the price of gas were reduced to 75 c."

Finally, the report disposes of the legal objection raised in the majority report, by declaring that a Legislative Act, embodying the recommendations as to the adoption and application of the sliding-scale, would be within legal principles well recognized and maintained by the State and Federal Courts of last resort. What the Company may think of the proposal, it does not seem to have been considered worth while to inquire; but that they may have something to say on the subject is highly probable. They are, it is true, hardly likely to offer opposition to any proposal that would secure to them a substantial reward for good management; but if higher dividends than 7 per cent. are already within their reach, where is the inducement for them to fall in with the new arrangement? Since, however, there is no reason to doubt that the sliding-scale system, if properly applied, would be as successful in Boston as it has undoubtedly been in this country, it is to be hoped that the difficulties in the way of its adoption may be successfully overcome. Anyhow, the minority of the Committee are to be heartily congratulated upon having produced a very able, lucid, and convincing report. Whether anything will come of it remains to be seen.

AMERICAN GAS-ADVERTISING LITERATURE.

In the "Journal" last week, reference was made to a volume, emanating from the Ohio Gaslight Association, in which Mr. George Williams, the Editor, has presented a large collection of methods suitable for adoption with the view of propagating gas business. It may not be inopportune to notice, in connection therewith, some samples of the literature which is being sent out by the Consolidated Gas Company of New York with the view of educating their customers in the use of gas, and which have been forwarded to us by Mr. W. J. Clark, the Superintendent of the General Fuel and Appliance Department of the Company. They comprise four pamphlets artistically got up, and a number of post-cards, all of which are particularly well suited to the purpose they are intended to serve.

Taking the two larger pamphlets first, they bear the title of "Gas Logic: Light Reading for Gas Users." The first edition of this pamphlet was brought out in July last year, and in its introductory passages its object is stated to be to explain, in a clear, simple, but interesting way, the importance and value of gas, the uses to which it may be put, the way in which it should be handled, and its capabilities as "a faithful, competent, and economical servant." The aim of the writer has been to furnish the most helpful and valuable information to the housewife—assisting her in solving the ever-present problems of light and heat, and instructing her in the proper and economical use of gas. The first subject on which instruction is given is the reading of the meter. As the quantity of gas burnt is frequently a matter of dispute, the Company strongly recommend consumers to read their meters, and enter the amounts on a card they supply, which also has upon it three dials with movable pointers and printed instructions. By doing this, they can easily satisfy themselves as to the correctness of the accounts rendered. The writer next gives some interesting facts and figures in regard to the supply of gas, and shows that the manufacture and sale of a commodity which the consumer may obtain by merely turning a tap, is not so simple a business as he imagined.

Passing over a short humorous story, we come to a chapter on the Company's educational work among users of gas, from which we learn that their lady demonstrators make an average of 20,000 calls a year for the purpose of instructing users of gas-ranges, so that the best and most economical results may be obtained. These demonstrators are not only experts in the handling of the appliances referred to, but professional cooks as well; and their services are at all times to be had, without cost, by consumers, on returning one of the post-cards which are liberally distributed by the Company. When, five years ago, the Company realized the value of employing competent women for this work, it was for a long time difficult to gain access to the kitchens. But by persistent and tactful effort, the prejudice at first entertained against people who were regarded as intruders into the sanctity of the home has been overcome, and for a self-evident reason—they are engaged in a good cause. Indeed, someone has aptly remarked that they are doing splendid missionary work, and achieving excellent results. They are now not only in demand among housekeepers themselves, but we are told that owners of large apartment houses are continually asking for one to be sent to instruct a new and "raw" maid, and possibly the tenants themselves. Each demonstrator presents a visiting card and also wears a badge, so that there is no danger of letting in the wrong person. The work of the demonstrator is directed mainly to emphasizing the two principal advantages of gas-stoves—viz., their cleanliness and economy—which, strange to say, are those which seem to be least understood by the majority of people. The writer offers some useful general remarks on the value of gas to the labouring classes and its inestimable benefits to the housewife, and gives a few hints on things users of gas-stoves require to know, and the knowledge of which enables them to get the best duty out of these appliances. The pamphlet closes with some seasonable recipes, and a list of the Company's offices and branches (at each of which there is a Gas Information Bureau), and a plan showing the parts of the city in which they are located. It only remains to say that at the foot of each page is a kind of gas apophthegm, printed in black type to attract the eye.

The second number of the pamphlet just noticed was issued early in the present year, and its contents naturally open with seasonable greetings. The matter, however, is of a very different character from that constituting the first number, although, of course, it has the same object in view—viz., the setting forth of the advantages of gas; and it is illustrated by a number of reproductions of photographs. The writer begins by laying stress upon the point that the interests of the Company and their customers are mutual; and all the employees are instructed to treat every complainant with courtesy and politeness. Consumers are therefore asked to communicate directly with the Company, no matter what their trouble may be—whether with the burners or the stove—so that the cause may be removed. Then the advantages of gas are dealt with from the standpoints of safety, economy, convenience, cleanliness, its comfort-giving qualities, and its capability of being readily applied. A chapter on "The Care of a Gas-Range" is illustrated by a view of what is called "a class of one in domestic economy"—in other words, one of the Company's demonstrators giving a lady a lesson. The great point, of course, is to keep the gas-range clean. In fact, the whole question of how to cook with a gas-range reduces itself, the writer says, to the two fundamental principles of good housekeeping—viz., cleanliness and common sense. Yet gas officials and demonstrators are all too often led to wonder whether these things have not now become old-fashioned. Care and a certain amount of intelligence are required in the use of a coal-stove; and so they assuredly are for the manipulation of a gas-range. The author of the pamphlet thinks that over every range should be hung a card bearing an illuminated text, reading: "Intelligence, Common Sense, Cleanliness—these three; but the greatest of these is Cleanliness." He then very properly lays down a few rules for keeping a range clean. The use of gas for heating purposes is next taken up; and there is shown an installation of gas apparatus for heating pressing-irons in a large tailoring establishment in New York City. Its extent may be estimated from the statement that during the busy hours in the afternoon about fifty men are kept at work with these gas-heated irons as fast as they can handle them. The writer passes on to deal with the installation and maintenance of incandescent burners.

The pamphlet contains among its miscellaneous subjects an interesting chapter dealing with the early history of gas lighting in New York, with a view (taken from an old painting in the possession of the Consolidated Gas Company) of the house of Mr. Samuel Leggett, in which gas was first used as an illuminant. He was the President of the New York Gas Company—a corporation organized in 1823. At that time the yearly output of gas was not much larger than the Consolidated Company now distribute between six and seven o'clock on a December afternoon. The plant sufficed for the demands upon it until 1848, when new works, of which a view is given, were built. In connection with these historical particulars, there is a reproduction of an ancient gas bill (1827) in the Company's possession. At the time it was issued, the price of gas was $10 per 1000 cubic feet—just ten times the amount now charged—and the consumer had, in addition, to pay rent for the meter and fittings. In those days, gas was indeed a luxury. As in the previous edition of the pamphlet, a number of seasonable recipes are given.

Another pamphlet bears the title "Making the Most of Life;" and in it the author shows how gas adds to the comforts of living. In the space of 16 small pages, he gives advice as to the selection of a gas-range, the care of it when chosen, and the best way of using it for cooking. He also emphasizes the value of the gas water-heater, and counsels the prudent housewife to read her meter, so as to be in a position to check her gas bill. This pamphlet has several well-executed full-page reproductions of photographs; and it closes with some remarks as to the utility of the gas "arc" lamp for shop lighting. A smaller, but equally attractive, pamphlet is entitled "The Cheerful Side of Life," which the writer shows is the home side. The comfort, health, and happiness of a household are largely a matter of temperature; and it is not difficult to prove that this can be best regulated by gas-stoves, which have all the advantages of open fires without the attendant unpleasant features, such as dust, ashes, and smoke. They can be brought into use in a moment without soiling the fingers; and their services can equally quickly be dispensed with. This is essentially a pamphlet for the home, and its score of small pages (2 in. by 4 in.) are full of good advice.

The Company send out six different kinds of post-cards, all of which are effectively arranged. In three of them the acrostic form is adopted to set forth the value of gas fires, radiators, and heaters; and they bear illustrations similar to those used in the pamphlets, but, of course, much smaller. The entire series of cards and pamphlets has been prepared with considerable care, and we can readily believe that their liberal distribution, under the supervision of Mr. Clark, is attended by excellent results.

The London and Southern District Junior Gas Association will hold a meeting next Friday evening, for the purpose of discussing the contents of the question-box. Seventeen questions have been sent in; and a list of these has been forwarded by the Hon. Secretary (Mr. P. F. Scarth) to the members.

OBITUARY.

SIR JOHN JAMES HARWOOD.

We regret to record the death, on the 15th inst., in his 75th year, of Sir John James Harwood, who until October last was a prominent member of the Manchester Corporation—having been an Alderman since 1881, and having on three occasions (in 1884, 1886, and 1887) filled the position of Chief Magistrate of the city. His name will be remembered by many of our readers on account of his association with the gas and water undertakings of the Corporation, and more particularly with the Thirlmere water scheme. He entered the City Council in 1866, as representative of the Cheetham Ward, and early in his career was placed on the Parks Committee, of which he became Chairman. He was Deputy-Chairman of the Gas Committee, under Alderman Lamb, and relinquished the post in 1886 to take the chairmanship of the Water Committee, in succession to Alderman Patteson, who had followed Alderman Grave, under whom the project was initiated. In this capacity he saw the beginning of the engineering works which eventually brought the waters of Thirlmere to the city; and eight years later—in 1894—he had the satisfaction of opening them in the presence of Alderman Sir Anthony Marshall, the first Lord Mayor of Manchester. He was then the recipient of an address from the Council, expressing sincere congratulations on the completion of the works. He was the last surviving member of the Sub-Committee entrusted with the duty of making the first purchase of land at the lake. He wrote an interesting "History and Description of the Thirlmere Water Scheme," which was published in 1895—in the preparation of this work receiving great assistance from Mr. W. Blackstock, the Secretary of the Water-Works Department. The volume records the fact, now almost forgotten, that the scheme was prefaced by a proposed joint supply of water to Manchester and Liverpool from Ullswater and Hawes water, which was abandoned. From 1894, Sir John Harwood took a less prominent part than he had hitherto done in the general affairs of the city; but his keen interest in the Water Department never diminished. The completion of the second pipe-line from Thirlmere in the autumn of 1904 was an event to which he had looked forward with great eagerness; and it caused him intense gratification. Sir John Harwood received the honour of knighthood in 1888. He was a widower; and he leaves a son, who has been associated with him in business. The funeral took place last Wednesday, at the Southern Cemetery, Manchester, where Lady Harwood was interred. At the meeting of the Water Committee of the Corporation on Thursday, a resolution of condolence with the family of the deceased was passed.

GEORGE KING HARRISON.

The death occurred on Monday last week, at the advanced age of eighty, of Mr. George King Harrison, who had for upwards of half-a-century been associated with the fire-clay industry of Worcestershire and Staffordshire, and was consequently well known to gas managers all over the country. He had also been more closely associated with the gas industry, inasmuch as he was the Chairman of the Stourbridge Gas Company before the sale of the undertaking to the Local Authority in 1893. By the death of Mr. Harrison and the recent retirement of Mr. William North, the Engineer, the connection of two gentlemen who at one time took a leading part in its management has been severed. Mr. Harrison began his business life in the Stourbridge branch of the old Stourbridge and Kidderminster Bank; but he eventually joined Mr. William King Perrens, and they carried on fire-clay works for many years at Cradley and Lye, as well as at Wilnecote, in Warwickshire, where they had collieries. The firm of Perrens and Harrison prospered greatly, and became famous for the quality of their goods and the straightforward character of all their business transactions. In 1866, they bought the small fire-brick works carried on at Brettell Lane by Mr. John Wheeley, and shortly afterwards the Hawbush Estate. In 1875, Mr. Perrens retired from the firm, and the whole of the extensive works came into Mr. Harrison's hands. The purchase of Hawbush, and subsequently of Nagersfield, brought about a great change in Brettell Lane. The fine deposit of fire-clay under the Hawbush was worked, and the fire-brick works erected on their present site were considered the model works of the neighbourhood. The pits under the estate were developed by Mr. Harrison, and the extensive fire-brick works at Brettell Lane were laid out on the most modern principles. In due course, the pits at Nagersfield were re-opened, and plant was put down of the most efficient description for the working of the minerals and the conversion of the clay into bricks. These extensive industrial operations gave much employment in the district, and added not a little to its prosperity. With advancing years, Mr. Harrison naturally felt that the management of his large works and the control of the great business which they involved were becoming an increasingly heavy responsibility; and therefore two years ago the concerns were converted into a limited Company, of which Mr. J. A. Mobberley is Managing-Director. Mr. Harrison's name was added to the Commission of the Peace for Staffordshire in 1877, and for Worcestershire in 1894. On the formation of the County Council of Worcestershire, he was elected representative of Lye, and continued a councillor till 1901, when there was a contest, in which he was defeated by a single vote. His services on the Council, however, did not cease on this account, for he was soon afterwards elected a county alderman. He was one of the prime movers in the scheme for giving Stourbridge and Birmingham direct railway communication; and the line that had small beginnings has now become an artery of the route from Birmingham to South Wales, and has immensely developed an important part of the Black Country. Mr. Harrison, who was a widower, leaves four sons and three daughters.

The death occurred on the 13th inst., at Llandudno, of Alderman T. P. Brownhill, who for many years had been Chairman of the Gas Committee of the Corporation of Walsall, and was at one time Mayor of the town. He was also a Borough Magistrate. During the whole term of his association with public life, the deceased was a conscientious and most indefatigable worker; and no member of the Town Council was held in higher respect and esteem by his colleagues and the public generally.

Owing to the removal by death of two of their colleagues—Major W. Fletcher Gordon and Mr. E. A. Flinders—the Directors of the Bombay Gas Company, Limited, have had to fill vacancies on the Board. Major Gordon had been a Director for the long period of forty-two years; while Mr. Flinders was an Auditor for thirteen, and a Director for four years. The Directors place on record, in their report on the past year's working, their appreciation of the long and valuable services rendered by both the deceased. In accordance with the Articles of Association, they have appointed Mr. W. G. Bradshaw, the Chairman of the Commercial Gas Company, and Mr. Charles Hunt, M.Inst.C.E., a Director of the South Suburban Gas Company, members of the Board. Another change in the *personnel* is announced, as Mr. Magnus Ohren, in view of advancing years, does not propose to continue in office as an Auditor of the Company.

We regret to learn of the removal by death, in his 57th year, of Mr. Frederick Russell, who for upwards of seventeen years held the position of Engineer and Manager of the Bexhill Water and Gas Company, which he resigned in October, 1904, on account of ill-health. On his retirement, he removed from Bexhill to Torquay; but a few weeks ago he was advised to come to London for an operation. To the effects of this he succumbed. Mr. Russell's connection with the Bexhill Company commenced on June 1, 1887; and in the following October he started the newly-built gas-works. The preceding month, however, he was in a position to furnish the town with a supply of water. From the opening of the works till his resignation he was constantly at his post. In 1892, he extended the water supply to Buckholt, where a new pumping-station was erected, and six years later to Sweet Willow Wood. In the discharge of his arduous duties, he was ably assisted by his two eldest sons, Sidney and Hubert. In his management of the gas undertaking, he was quick to recognize the value of the prepayment system; and in 1894 he introduced penny-in-the-slot meters. Before going to Bexhill, Mr. Russell was the Manager of the Mountain Ash Gas-Works, and had previously held a similar position at Ilfracombe. He was a Mason of twenty years' standing; and when Master of the Hastings Lodge in 1903, he initiated two of his sons into the Craft. The deceased leaves a widow, two daughters, and four sons. Two of the latter are at Bexhill—one Outdoor Superintendent, and the other Assistant-Manager in the Works Department—while Mr. Hubert Russell is the Gas Engineer and Manager of the Abergavenny Corporation.

PERSONAL.

Mr. J. A. Fielding has relinquished the position of Manager of the gas-works at Bastia, Corsica, after holding it for nine years, and is returning to England. He is succeeded by Mr. D. H. Anderson.

We are pleased to learn that Mr. E. J. Brockway, the Engineer and Secretary to the Cleethorpes Gas Company, has been unanimously re-elected Chairman of the Urban District Council, to which position he was appointed a year ago. Mr. Moody, who proposed his re-election, remarked that Mr. Brockway had carried out his duties in a very satisfactory manner. Never since he had been on the Council had a Chairman conducted the business in the same way that Mr. Brockway had. Other members also spoke in a similarly complimentary strain of Mr. Brockway's services. Mr. Henry Tobey, the Manager of the Malton Gas Company, has also been re-elected to the position of Chairman of his Urban District Council—a sign that his past services are fully appreciated.

Mr. J. F. Smith, of Halifax, who has just been appointed Superintendent of the Scarborough Gas-Works, commenced his work at the Effingham Street works of the Sheffield United Gas-light Company, with whom he served five years. In 1892, he entered the service of the Birmingham Corporation, as Assistant Chemist at the Saltley works—a post which he held for about eight years. During the time he was at Birmingham, he took charge of the Swan Village works as Acting-Manager for a period of six months. Six years ago, Mr. Smith entered the service of the Halifax Corporation as Chemist; and during the time they were without a Manager, he took charge of the works for three months, at the end of which period he was appointed Assistant-Manager; and this post he vacates to go to Scarborough.

LIGHTING NEWPORT (MON.) TOWN DOCK WITH HIGH-POWER INCANDESCENT GAS-LAMPS.

Newport (Mon.), as is well known, has several large docks. The smallest of them is the Town Dock; but it would not be considered small in situations outside the great mineral area of South Wales and Monmouthshire, as it has altogether a water area of 11½ acres. The question of the effective lighting of the docks has been under the consideration of the Alexandra Docks and Railway Company at Newport for some time, and experiments were first made at the Town Dock. An installation of very powerful oil-lamps was put up; and at the request of the Newport Gas Company, a trial was made at the same time of incandescent gas-lamps ranging from 400 up to 1200 candle power. It may also be mentioned that the Docks and Railway Company have an electric power station used for lighting some of the adjoining docks; but no electric lamps were tried in this competition, although it was well understood that if neither gas nor oil gave the results anticipated, recourse would be had to lighting by electricity. In the result, the Gas Company were successful in obtaining the order for lighting the dock.

The installation consists of eleven large lamps, each of 1200-candle power, and 24 lamps of 400-candle power each. The installation was brought into action on the 15th of May last, and during the past eleven months has given great satisfaction. Six of the 1200-candle power lamps are fixed, three on either side of the lock at the Pier Head; and they are exposed to the most furious gales blowing across the marshes from the Bristol Channel just below. Five more of the very large lamps are placed near special coal-hoists and cranes. The 400-candle power gas-lamps are distributed to the best advantage for carrying on the work of the dock, which not only includes the shipping of coal, iron, and steel, &c., but the discharging of iron ore, timber, grain, and general cargo.

Some of the lamps are fixed at a height of from 18 to 20 feet, in order to light the interior of trucks during working; and the lamps generally are so arranged as to obviate shadows as far as possible—a highly important matter where there is constant movement of waggons. However, not only has the interior of the waggons been illuminated, but also the open holds of vessels receiving coal or discharging cargo. Up to the present time, the height of 20 feet has been found adequate for this dock; but should the Gas Company be called upon to light some of the larger docks, where vessels up to 11,000 tons burden enter, probably a lamp of still higher power than any that has as yet been employed, fixed at a greater height than 20 feet, will be the kind to be installed.

It was at first greatly feared that the fragile incandescent mantle would succumb to the rude atmosphere of a great mineral dock, with its showers of coal dust and constant movement of waggons loaded with coal, iron, pitwood, and iron ore. But the Gas Company's Engineer (Mr. Thos. Canning, Assoc.M.Inst.C.E.) had from the first full confidence that a safe arrangement could be made of the burners, and a lantern constructed and so fixed on the column, as to preclude more than ordinary risk to the mantles. The result anticipated has been achieved, but, of course, it will be understood that dock lighting under such conditions is necessarily more difficult than street lighting. This was especially felt at first, as a period of some weeks had to elapse, and many alterations to be made, before smooth working was reached. The success, however, has been extraordinary; and to none has it given more satisfaction than to captains of vessels entering the Town Dock. The experienced Dock Master is now considering whether the power of the lamps at the Pier Head might not be reduced.

The scheme for lighting the dock, the general effect of which is shown in the illustration, was arranged and carried out by Mr. Canning and his staff, aided by the willing assistance of the engineering staff of the Dock Company. The fact that incandescent gas lighting has been adopted by Mr. John Macaulay, the General Manager of the Company, who is so well known for his progressive ideas and great success in dock management, is probably the strongest proof that can be given of the value of the system for dock lighting. It should be added that the Lucas lamps (modified to suit the circumstances) which constitute this installation were supplied by Messrs. Moffat's, Limited, and the lamp-columns by the Mannesmann Tube Company. In the fixing of the slender columns, however, many precautions had to be taken, and considerable expenditure incurred, so as to give them the requisite stability. For further work of the kind, it is contemplated to design a stronger type of pillar, without departing from the lightness and grace of the present columns.

Prismatic Shades.

We have received from the Prismatic Shade Company a specimen of their productions. The sample shade is designed for use with incandescent electric lamps; but it is obvious that it can, with facility, be adapted for use on bijou inverted incandescent gas-burners. There have been several prismatic devices introduced from time to time for the collection and reflection of light. In this case, we have a design that appears to be novel; and from the rough and ready test (not having the necessary supporting fittings at hand) that we have been able to apply to it, its utility can be attested, and its ornamental effect pronounced excellent. It is conical in form, and is made of clear crystal glass. Mr. Lancelot W. Wild, of the Westminster Electrical Testing Laboratory, has made some photometrical examination into the merits of the shade. He tested its reflective power in a vertical direction; and his report states that, with a 200-volt 16-candle power lamp taken from stock at random, the following two measurements were obtained: Vertical candle power with shade, 20·8; without shade, 8·5. The shade, therefore, according to the test, increases the illumination in a downward and vertical direction 2·45 times. Whatever in the way of enhanced effect can be obtained by these shades on incandescent electric lamps, can, of course, be secured by their use on incandescent gas-burners.

German Association of Gas and Water Engineers.

A preliminary announcement has been made as to this year's meeting of the Association. It will be held at Bremen from the 27th of June to the 1st of July inclusive. There will be a reception on the evening of the first day; the business gatherings will take place on the three following days; and the last day will be devoted to a sea trip to Heligoland. The detailed programme will be issued later; but intending participants are urged to secure their rooms at Bremen at once, as an unusually large muster, which will overtax the powers of accommodation of the hotels, is fully anticipated by the Council of the Association.

Scottish Junior Gas Association (Eastern District).—Members of the Association to the number of about thirty paid a visit to the Cowlairs Locomotive Works of the North British Railway Company, at Glasgow, on the afternoon of Saturday, the 14th inst. Representatives of the Railway Company showed them round the works with great courtesy. The place is a large one, and contains much machinery and plant interesting to engineers; and the visitors were highly pleased with what they saw. The different groups having lost touch with each other, it was found impossible to accord a formal vote of thanks to the officials.

INVERTED LAMPS FOR STREET LIGHTING.

By W. R. Herring.

[It should be pointed out that these notes on the experience at Edinburgh with incandescent inverted burners for street illumination have been contributed at the request of the Editor.]

The Lighting Committee of the Edinburgh Corporation have resolved to recommend the City Council to convert the whole of the flat-flame burners that are not at present on the incandescent principle to this latter system, and have resolved to recommend the inverted burner for the purpose. About 6000 lamps remain for conversion out of a total of about 11,000 all told.

It may be interesting to note that we first experimented with the inverted incandescent burner, with a view to adapting it to street lighting, early in 1904, as the difficulty we had in Edinburgh in inducing the authorities to adopt the incandescent system of lighting was the fact that our street lamps had hitherto been rated at 2 cubic feet per hour; and the smallest type of incandescent burner that could then be recommended was 3 cubic feet per hour—thus adding considerably to the cost of public lighting as distinct from England, where the introduction of incandescent burners reduced the consumption.

The first lamp fitted in a public thoroughfare was set up on June 13, 1904, in New Street. Later on some further lamps were fitted up, among others two at my house—one in the courtyard at the back, and one at the stable yard. These lamps have stood the test of time, with a very large admixture of storms; and they continue to be in every way satisfactory. The very marked superiority of both the appearance and effective illumination yielded by a lantern when fitted with the inverted burner, and the same lantern fitted with an upright burner consuming more gas, quickly convinced us that the future, so far as Edinburgh was concerned, lay in the adoption of this burner. Caution, however, being our natural characteristic, no great strides were made until further experience was gained by the lighting of some streets; and this has been proved during the past winter, with the result that the Lighting Committee are so satisfied as to recommend their universal adoption in the future.

A few figures as to the results we obtain with these burners may be of interest. At the outset, however, it is regrettable that we have not got any records of the spherical illuminating power of these lamps; our tests having been taken on a 100-inch bar photometer, and the burners removed from the street lanterns (after use) for testing purposes, tested horizontally. At first we experienced considerable difficulty in governing the gas consumption to the burners. In fact, the type of governor ordinarily used with incandescent burners is, to some extent, inapplicable, in consequence of the fact that the governor is only part of the governing apparatus, and that the burner tip is an integral part of the governing apparatus itself, in the ordinary sense of the term. This, however, is a matter that would in itself form the subject of an article which I am not, at the moment, prepared to write. I will, however, give some results obtained from a burner taken from one of the lamps in the public highway, which burner had been in use during the winter. The burner and governor were removed from the public lamp, and attached to the photometer standard just as received. The governor appeared to be stuck fast, as it did not move when shaken. A mantle and a clear glass globe were put upon the burner; the mantle being on the same plane as the pentane lamp with which it was compared. The rate of gas consumption was yielding 74-candle power, or 30·33 candles per foot of gas consumed. The following day the same burner was again tested, though by this time the governor appears to have come into action, without anything having been done to it. Various pressures were applied at the inlet to the governor, which also yielded various rates of consumption; the quantity increasing slightly with the increase of pressure. The lowest result recorded was 30·89 candles per foot of gas; and the highest result, 32·86 candles. These results fully equal the best results we obtain with a No. 4 Kern upright burner, but they are superior to the results yielded by a No. 3 Kern upright.

Our present difficulty is to ascertain the proper rating for these burners. There is no doubt a very real difficulty in getting a governor to act efficiently and consistently with incandescent burners such as they do in connection with ordinary luminous flames, owing to the fact that the smallness of the gas apertures in the nipples of the incandescent burner necessitating a higher pressure, causes the governor float to fall out of action at certain minimum pressures—in fact, we find the ordinary governor fails to act when the pressure at its inlet is anything below 20-10ths, and that from 20-10ths and upwards to 40-10ths, there is a slight increase in the gas consumption as the pressure increases. The difficulty, therefore, of rating incandescent burners on the average consumption is one that will have to be met in the near future. For instance, an inverted burner with a three-hole injector, passing 2 feet of gas per hour at 15-10ths pressure ungoverned, will—when burned for twenty-four hours with a varying inlet pressure adjusted to exactly what prevails in the town's supply ranging from 15-10ths to 35-10ths—give an average consumption of 2·74 cubic feet per hour over a period of 24 hours' burning. The same burner tested for consumption at varying inlet pressures yielded the following results.

Table A.

	C. Ft.		C. Ft.
10-10ths	1·70	25-10ths	2·65
15 ,,	2·06	30 ,,	2·86
20 ,,	2·41	35 ,,	3·12

Again, dealing with the same burner controlled by a 2 feet per hour disc governor fixed at the base of a swan neck, when burned for 24 hours under normal town's pressure conditions varying from 17-10ths to 33-10ths, an average consumption of 2 cubic feet per hour was the result.

Tested separately with the governor attached, the consumption at the varying pressures are as indicated in Table B.

Table B.

	C. Ft.		C. Ft.
10-10ths	1·49	25-10ths	2·13
15 ,,	1·93	30 ,,	2·11
17 ,,	1·97	33 ,,	2·08
20 ,,	2·13	35 ,,	2·08

With regard to these tests, it may be interesting to note that the illuminating power practically increased in proportion to the consumption of gas—only falling away very slightly as the maximum pressures were reached. The difficulty, however, of adjusting a lamp governor with any type of incandescent burner to yield the proper rate of consumption with varying inlet pressures on the district, is a real one that has not yet perhaps received the attention it deserves. If an incandescent burner of any type is removed from a public lamp, and tested at various inlet pressures, it will be found that the consumption, instead of being constant, varies with the pressure on the governor inlet.

What originally led me to the investigations which I have only very briefly outlined (and which I may say I have not even yet completed) was the trouble experienced with the deposit of carbon in the upper part of the inverted burner fitments. It was at first thought that the admixture of gas and air was improperly proportioned; but there appears to be little doubt that it originates from the low pressure during the midnight hours, which not only reduces the consumption of gas, but seems to entirely upset the injector effect of the gas current, and thus destroys the proportion of inflowing air, for we find by suspending a sheet of bibulous paper above the burner that no darkening takes place when the gas inlet pressure is at or about 20-10ths and upwards, but there are decided evidences of improper combustion below 15-10ths. pressure.

Another point of very considerable interest is the great variation in the light-yielding effect of different burners, with the same consumption of gas, tested and burned under identical conditions. We have, I believe, tested every make of burner now on the market; and the following scale is the best possible illuminating power, at the consumption and pressure named, that could be obtained. One word perhaps should be added with regard to these illuminating power tests, and that is to mention that the calorific power of our gas is greater than in England, averaging about 700 B.T.U. gross.

Table C.—*Statement of Illuminating Power Tests on Various Makes of Inverted Burners (Edinburgh Gas).*

When testing, the gas pressure was varied, and readings taken so as to ascertain the most effective pressure to give the maximum yield of light. Thereafter the burner was tested in the ordinary way.

Index to Burner.	Pressure. Tenths.	Consumption.	Candle Power.	Candle Power per Cub. Ft.
A.	23	2·30	59·5	25·87
B.	20	2·71	64·0	23·61
C.	20	2·97	70·0	23·52
D.	15	2·84	74·0	26·05
E.	15½	2·75	75·0	27·27
F.	20	2 95	59·0	20·00
G.	16	2·57	61·0	23·73
H.	18	2·62	64·0	24·42
I.	18	1·90	39·0	20·52
J.	25	2 65	78·0	29·43
K.	20	2·20	72·0	32·73
	25	2·47	81·0	32·79
L.	21	2·76	62·0	22·82
M.	20	3·45	76·0	22·03
N.	27	2·40	34·0	14·16
	30	2·54	36·0	14·17

Incandescent Gas Litigation in Germany.—The plaintiffs in the action brought against the Board of the "Helios" Gasglühlichte Actien Gesellschaft ("Helios" Incandescent Gaslight Company), which went into liquidation as long ago as 1901, have failed to establish their case, which aimed at the recovery of £10,000, on the ground of alleged irregularities. The protraction of the proceedings is stated to be due to the exhaustive examination of experts in regard to the question as to whether the "Helios" light was, on the formation of the Company, of the value at which it was brought in as an asset. Dr. Bunte, of Carlsruhe, who was appointed as the Technical Examiner, is now reported to have decided that at the time referred to the "Helios" was the best of the many lights then on the market, and that considerable profits might have been obtained from its exploitation, if the possibility of commercial working had not been frustrated by the action of the German Auer Company. The Civil Court of the Berlin Land Gericht I. has given judgment against the plaintiffs, and ordered them to pay the whole of the costs.

OHIO QUESTION BOX.

[Third Article.]

Manufacturing Chemistry and Physics, Storage, and Distribution Sections.

We must pass in cursory review the succeeding sections of the volume. "Manufacturing Chemistry and Physics" is the heading under which there are no less than 72 questions, covering quite a formidable mass of topic.

We are faced quite early with the question, "Why is iron oxide preferred as a gas purifying agent?" There has been a good deal said recently in this country as to why it is preferred here. American gas managers have something to be thankful for in that they are not subjected to petty restrictions that have so greatly vexed the souls of many British gas managers, that have been used for bringing ignominy upon them, and that have not improved the world a jot by their infliction. The American gas engineer's choice of purifying material is entirely guided not by law but by economic considerations. He uses oxide, we find from numerous answers, because it is cheaper than lime, because spent lime is of practically no value to him, because it does away with the spent lime nuisance, because it can be revivified over and over again, and because it is the most satisfactory all-round purifying agent of which he knows. Attention is transferred from oxide to the use of air in purification; the inquiry being made as to whether it is true that if the air used for *in situ* purification be first passed through the tar-well or seal box, it will pick up a certain quantity of hydrocarbon. There are only two answers, and both in the affirmative. The first correspondent explains that it is due to the fact that there is always a certain amount of hydrocarbon vapours suspended over the tar. If these vapours be swept out by fresh air, more of the hydrocarbons will vaporize; the amount of vapours always tending to a certain maximum. If, however, the air were swept over the tar continuously, the amount of vapours carried along would be very small, as the air would not have time to become saturated, or nearly saturated, with the vapours. The second correspondent, while admitting the truth of the proposition, adds that the quantity of hydrocarbon vapour picked up is small. If the air were drawn into the main at a point where the gas is still hot—say, at the hydraulic main, or at the condenser inlet—much better results would be obtained.

The contradictory information given in the replies of which mention was made in our editorial columns last week, meets the eye of the reader again and again. Here we have, as an example, the question, "What is the difference in the quality of gas that is manufactured from oil and coal, and which contains the greatest number of heat units? What is the relative cost per 1000 cubic feet—oil at 4 c. per gallon, and coal at $3·25 per ton?" By one contributor, it is stated that oil gas is richer than coal gas, giving a candle power of 60 to 70 when uncompressed. It has a heating value of 1400 B.T.U. per cubic foot; coal gas, about 700 B.T.U. Like information is given by a second correspondent, who adds that, with oil at 4 c. per gallon, 10,000 cubic feet of gas would cost $3, against $3·25 for coal. But it is a complete contradiction that a further correspondent gives to these general replies and to accepted text-book information when he says that under ordinary conditions, coal gas contains the greater number of heat units, and, under such conditions, oil gas should cost approximately 25 per cent. less than coal gas, depending, of course, upon the cost of other materials. Then it is asked, "What percentage of the calorific value of water gas is contributed by the oil enrichment?" The replies vary in statement between 52 and 75 per cent. Fuller information is accorded by four other correspondents. Mr. Charles F. Botley writes that the proportion of the net calorific value of carburetted water gas of (say) 21-candle power, contributed by the oil enrichment, appears to be nearly 50 per cent.; but this figure will be influenced by the means employed for taking both the calorific value and the illuminating power of the gas in question. Mr. Oscar H. Fogg says the percentage of the calorific value of carburetted water gas contributed by the oil enrichment varies from approximately 50 per cent. in a 22-candle power gas to about 65 per cent. in a 28-candle power gas. Dr. H. B. Harrop observes that blue water gas will run from 300 to 365 B.T.U. gross, depending on how intelligently it is made, and what fuel is used. The percentage of enrichment due to the oil, when the heating power is raised to 600 or 650 B.T.U. is evident. Mr. W. H. Fulweiler remarks that "uncarburetted Lowe water gas will run about 322 B.T.U.; while 23-candle carburetted gas will run between 660 and 690—say, average at 320 and 675 B.T.U. respectively, then 52·5 per cent. of the heating value of the 23-candle power gas is due to the oil used."

A pertinent inquiry is included in this section, as to why each gas company in the United States has not contributed towards the maintenance of a laboratory to conduct scientific investigations in the interests of the gas industry; the utilization of tar being offered as an example of a subject that would repay investigation? There is only one correspondent who ventures a reply. His opinion is that one of the reasons why scientific investigations of the present so-called minor bye-products of the gas industry are being neglected in the United States is that, in the present stage of the chemical industries in the country, attention is being paid chiefly to the manufacture of heavy chemicals, while the finer chemicals, the artificial dyes, and the finer coal-tar products are being almost entirely neglected. The manufacture of coal-tar products has, in fact, hardly begun in the States. It is believed, however, that further investigation will bring many treasures, and that American gas companies will utilize many bye-products which to-day are troublesome to dispose of.

The section devoted to "Gas Storage" is a disappointing one and there is not much that is instructive to be gained from it. We will pass it over, just extracting as we do so the information that the spiral-guided holder, as far as is known, has only found adoption at Malden, Mass., and (it is believed) at Halifax, Nova Scotia. The capacity of the Malden two-lift holder is 300,000 cubic feet. But the dolorous statement is made concerning it that "the holder is in an exposed position, and it is a question whether it will live through the March gales."

In the "Distribution Supplies and Materials" section, a large variety of matter engages attention; but many of the inquiries cannot be definitely answered owing to time and local circumstances affecting consideration. The proper place for the setting of meters is an inviting subject for many correspondents; and the precautions to be adopted in the handling of meters is likewise fruitful in discussion—the general view being that they should always occupy an upright position in waggons; and should be packed in bags and, during transit, have pads placed between. Whether it is good practice to instal less than 6-inch gas-mains must of necessity be a question purely of local condition; but three pages of answers are bagged by the inquiry. The use of indiarubber tubing on gas-consuming appliances is strongly condemned; and a little later comes a question over which we can well afford to pause. It is as to the use of insulated couplings in wrought-iron pipe for the purpose of preventing electrolysis. The first two answers do not inspire hope. The experience of one contributor has taught him that no matter how close together are the insulating couplings, his pipes suffer from electrolysis; and the conclusion has been arrived at that the damage is much more spread when using insulated couplings than when not. When, writes another contributor, the current can find so many other ways than the coupling for passing from one length of pipe to another, the results from the use of insulated couplings are not all that could be desired. Then there is a complete change of view—one contributor asserting that, where a pipe is composed of a conducting metal, its resistance can be increased, and the current correspondingly reduced, by properly installing an approved type of insulating joint. Says another, insulating couplings properly installed afford absolute protection from electrolytic action; "the insulating method, in fact, is the only one which has been used with perfect success for the elimination of electrolysis." Still another correspondent testifies to the virtue of the couplings in remedying local troubles. He asserts that the system, if carried to its ideal conclusion of an insulating coupling for each joint, would be better than anything now in use. "The ideal would be a perfectly insulated pipe or a non-conducting pipe." Further testimony is that the use of insulated couplings when properly installed in wrought-iron pipe is a preventive of, but not a sure cure for, electrolysis. A kindred inquiry is as to whether it is a good thing for a gas company to bond its gas-mains to the trolley tracks. There are affirmative and negative answers. Referring to the latter, it is asserted that bonding is apt to cause increased electrolysis at the pipe-joints, due to the increased current flow induced by making the pipe a better return conductor. The bonding, asserts another correspondent, increases the current flow on the mains to a very dangerous point; and with the increased current flow comes increased disintegration at all danger points. In addition, with mains bonded to tracks, the amount of current carried on the mains is sufficient to cause an arc when the lines are cut or brought together, with the consequent danger of the gas being ignited and an explosion caused. If, says another correspondent, all the gas-lines were of wrought-iron pipe and the electrolysis happened to be confined to certain spots, bonding in these locations would either decrease or prevent the electrolytic action by offering a metallic path for the current, and though the total current flowing in the pipe would probably be largely increased, it might be productive of no bad results. But if the pipe was of cast iron with lead joints, the increased current would act destructively on the lead, rendering it spongy in a short time. In no case should bonding be resorted to where cement joints or insulating couplings have been used, as the increased current due to the bond must leave the pipe, and take the ground in order to get round the insulating joint—thus producing an ideal chance for electrolysis at each joint so made.

Municipal ownership was partly approved by the voters of Chicago on the 3rd inst. The proposition to operate the street railways by city employees was voted down. There were 120,911 affirmative and 110,260 negative votes; but as a three-fifths vote was necessary to carry the proposition, it was lost. It is understood that the Mayor is disappointed at the refusal of the people to authorize the city to operate the lines, for he does not agree with the famous report of his adviser, Mr. Dalrymple, of Glasgow (to which reference has been made in the "Journal"), that the American system of popular government as now conducted renders inadvisable the public management of undertakings employing large numbers of men.

LOCAL AUTHORITIES & WATER UNDERTAKINGS.

By a curious coincidence, the present issue of the "Journal" contains two reports which present interesting phases of the question of the ownership of water undertakings by local authorities. In one case, a Corporation are desirous of carrying into effect a long-cherished wish to acquire the undertaking of a flourishing Water Company; while in the other, an Urban District Council are equally desirous of handing over theirs to another Company who are no less prosperous. It will be seen from the reports that on Tuesday last the Portsmouth Town Council passed a resolution, practically without a dissentient voice, to adopt a report, presented by a unanimous Water Committee, recommending the purchase of the water-works at the cost of something more than a million sterling; while next day the Leigh-on-Sea District Council decided to sell their works to the Company supplying Southend, of which Leigh is, to all intents and purposes, a suburb. The circumstances which have led to these decisions are worthy of our readers' attention.

In referring to Portsmouth just now, the action of the Corporation was alluded to as the carrying into effect of a long-cherished wish. As a matter of fact, the water-works purchase question has been before the town for half-a-century; for as long ago as 1855, the late Mr. R. W. Ford, who for about forty years was Secretary of the Water Company, brought forward a proposal for the acquisition of the works by the local authority. If his suggestion had then been acted upon, the entire concern could have been had for about £42,000. This, however, was not done; nor was the proposition entertained on its revival on three subsequent occasions. Five years ago, however, the matter was once more brought forward, and the Corporation were given what was said to be their "last chance" of acquiring the water-works. This time they availed themselves of it, and decided to give the Company £1,250,000, in 3 per cent. bonds, for their undertaking. They had then a share capital of £375,000 (against £80,000 at the outset), a sum of £125,837 on loan, and a reserve of £16,500. It was made clear, however, that purchase on the terms named would entail a rate-in-aid of £15,000; and it was thought by many that a loss would be incurred during the early years of municipal management—indeed, that it would be something like fourteen years from the date of purchase before the income balanced the expenditure. The result was that the ratepayers would not sanction the scheme. The Water Committee reported to this effect to the Corporation; and the matter once more dropped.

It was generally thought that the last chapter in the history of the water question had been written, and the book closed, never to be re-opened; even the reviver of the proposal to purchase expressing the opinion that the Corporation had lost their "last chance." But he was wrong. They found another, and have not let it slip. They have agreed to give each shareholder of the Company sufficient 4 per cent. stock to secure to him his full statutory dividend, to pay off within a year the debenture debt of £90,487, and to take over the terminable debenture debt of £77,050, as well as all debts, liabilities, contracts, and pensions of the Company. The present value of the amount owing in back-dividends (about £19,133) will be paid by the Corporation; but to meet this there is a reserve of £17,832, against £16,500 five years ago. The works are to be taken as they stand. The tenth recommendation in the Water Committee's report to the Town Council is the one that will be scrutinized most closely by the ratepayers, who will find therefrom that the liabilities which the estimated gross profit of £46,375 will have to bear will come to £43,669; so that the credit balance will be only £2706. This amount is arrived at on the assumption that eighty years will be allowed for the redemption of the stock. This was the period taken on the previous occasion; and the wisdom of so doing was adversely criticized at the time. We will not raise the question again. Mr. Pink, however, who moved the adoption of the report, did not pass it over. He warned the Council that they must not expect to make a "big profit" on the concern; but he said that "if they could get the sinking fund for a long term of years, he thought that eventually they would be enabled to make a small profit." Of course, if by "long term" the speaker meant a hundred years, the credit balance will be proportionately increased. The question is whether they will get it, or even the eighty years on which their balance of £2706 is based. Why, for the sake of making this small profit, did the Corporation think it advisable to disturb the existing conditions? Surely the town is not badly served by the Company, who not many years ago voluntarily made substantial concessions to the consumers. The reason appears to be that they consider the transfer of the water undertaking is necessary on "moral grounds;" and they look confidently forward to being able to confer certain advantages which they say they have hitherto been unable to obtain. It must be acknowledged that the financial aspect of the question is better than it was in 1901; but whether the ratepayers will consider it sufficiently good to justify them modifying the opinions they then held, remains to be seen. To all appearances, however, the purchase will this time be carried through.

In the case of Leigh-on-Sea, the Urban District Council have found the supply of water to be an unprofitable business, of which they would now be glad to be relieved. During the eight years they have been in existence, they have lost, on an average, £526 a year; and as their loan indebtedness amounts to about £12,776, they do not feel justified in increasing it to undertake extensions, so as to enable them to furnish a much-needed constant supply of water. Indeed, it appears to be very doubtful whether additional borings, which, of course, would necessitate considerable outlay, would materially increase the yield, as for some years past there has been a shrinkage of water over the whole of the south-east of Essex. The works have cost about £15,685; and the Southend Water Company have expressed their willingness to take over the concern, with the loan indebtedness of the Council in respect of it, and pay them in cash the difference between the £12,776 and £14,000. The Council will support the Company in their application for parliamentary powers to complete the purchase; and the latter will be prepared, should their own requirements admit of it, to arrange, as from the date of the provisional agreement to be come to, to afford an auxiliary supply of water, in case of emergency, in the district of the Council. The Committee who had had the negotiations in hand unanimously recommended the acceptance of the Company's terms. It was pointed out that the Council could not improve the undertaking without increasing the charge for water, which at present they have no power to do, whereas by selling it they would get out of their difficulties, and in a twelvemonth be in possession of a constant supply of water. Some members of the Council thought the matter should be adjourned till after a poll of the ratepayers had been taken on the question; but in the end the Committee's report was adopted. It seems to us that the Council have come to a sensible conclusion. To have gone on longer, in view of the opinion expressed by their Consulting Engineer, would only have seriously handicapped a growing seaside resort. But by transferring their water undertaking to their neighbours, they ensure for the residents, temporary and permanent, a much better supply than they could have given them. True, they have relinquished the privilege—so highly prized by some local authorities—of being their own purveyors of water; but they have the credit of sacrificing sentiment for the general good.

THE EARTHQUAKE AT SAN FRANCISCO.

Destruction of Gas and Water Works.

The news which reached London on Wednesday last, that San Francisco—by far the largest and most important city in Western America—had been visited in the early morning by an earthquake which had practically destroyed it, coming as it did after the outbreak of Vesuvius and the terrible loss of life and property which it entailed, led thoughtful people to reflect as to how far they will be justified in future, in view of the forces at work in the interior of this globe of ours, in speaking of the ground upon which they walk as *terra firma*. During the past twelve months, we have been made aware of the occurrence of a remarkable series of disturbances which have proved that what we call solid earth is in reality little more than, to use a simile employed by a writer in "The Times," a "shivering jelly, perpetually vibrating to shocks great and small." The final catastrophe of the series—the one at San Francisco—has exceeded all the others in severity. The first shock was followed by the outbreak of fire all over the city; and a second occurred in the afternoon. Unfortunately, as was only to be expected, the violent disturbance of the ground dislodged the gas and water mains, not only rendering the firemen helpless in coping with the flames, but in the initial stages of the catastrophe considerably intensifying them. This additional source of trouble was, however, soon removed by the destruction of the gas-works situated to the south of Market Street. So that, no gas being available, it could not have continued for any length of time, as the first newspaper reports received on this side made out, to add to the fierceness of the conflagration. Moreover, it was stated later that lighting power of every kind had gone, and that at night no gas or electric lamps could be used to relieve the horror of the situation. By Friday, however, repairs had been effected to the water-mains, which allowed of a supply—it need hardly be said that it was greatly needed—being afforded. It is even now almost too early to estimate the extent of the loss of life and property resulting from this terrible visitation; but the former has been put at from 1000 to 5000, and the latter is valued at £80,000,000.

In view of the damage which the gas-works have sustained, it may be of interest to give a few particulars of the four undertakings engaged in the supply of gas at the time of the publication of Brown's "Directory of American Gas Companies" for the year 1903. The largest is the San Francisco Gas and Electric Company, whose capital stock was $20,000,000, of which about $13,000,000 had been issued. The Company make both coal gas and water gas—the latter by the Lowe system—and their annual output was approximately 1300 million cubic feet of gas of 22-candle power. The proportion sold for fuel purposes was 41 per cent. The length of main laid was about 280 miles, serving a population of 400,000, who had 35,840 meters and 9500 stoves in use. In their Electric Lighting Department, the Company use both the arc and the incandescent system, but principally the latter; the number of public lamps being 925 of the former and 4000 of the latter. The next largest concerns are the Equitable Gas Company and the San Francisco Coke and Gas Company, each of which has a capital of $5,000,000. They work the Lowe

process; and the former supplied in 1902 about 300 million cubic feet of gas of 23-candle power, of which 40 per cent. was sold for fuel purposes. The population served was 342,782; and the length of mains about 24 miles. Working statistics are not given for the Coke and Gas Company. The fourth Company is the Pacific Gas Improvement Company, whose capital stock amounted to $3,500,000. They work the Springer and Improved Lowe processes, and make yearly about 600 million cubic feet of 21-candle gas, of which 40 per cent. is sold for fuel purposes. The population of the district supplied is 450,000, on 140 miles of main; and about 15,000 meters are in use. With regard to price, there appears to have been competition in certain districts, for the charge by the Equitable Company is only 50 c. net per 1000 cubic feet; and this is the figure in parts of the area of the Gas and Electric Company as well as in that of the Pacific Company. These Companies may, however, charge up to $1·30 and $1·25 respectively in the rest of their districts.

The Pacific Coast Gas Association have their headquarters, and hold their annual meetings, in San Francisco, which is the home of a goodly number of the members. We may fittingly conclude this short account of the gas undertakings of the city—now to a large extent destroyed and deserted by its terror-stricken inhabitants—by expressing the hope that none of them have sustained serious personal injury, and that order will have been sufficiently restored, when the time comes for holding the annual meeting in July, to allow of a gathering as pleasant and profitable as could be expected under such conditions.

Annual Meeting of the Societe Technique du Gaz.

Notices above the name of M. Visinet, the President, have just been issued, informing members that the annual meeting of the French Gas Society will take place this year in Paris on June 19, 20, and 21. On the morning of the first day will be held the ordinary general meeting, at which new members are admitted, the reports of the Committee and of the Treasurer are read, and new members are elected to the Committee. The afternoon opens with the distribution of prizes and awards, after which a start is made with the reading of technical papers. These will be continued on the following mornings; the afternoons being devoted, as usual, to visits to works of one kind or another. The annual dinner takes place in the evening of June 20. The last date allowed for the sending in of papers is May 20.

The Vertical Retort-Settings at Mariendorf.

The report which was given in the "Journal" for the 10th inst., of Herr E. Körting's paper on "Vertical Retort-Settings," did not include a few figures which have been embodied in the paper as subsequently published in the "Journal für Gasbeleuchtung." The Westphalian coal (*ante* p. 98) which was used in the trials had the following average composition:—

Volatile constituents	26·1 per cent.
Water	2·5 ,,
Coke	71·4 ,,
Ash	8·3 ,,

To the average working results obtained in the month of February, should be added:—

Yield of tar . . = 4·58 per cent. of the weight of coal carbonized
,, ammonia = 0·326 ,, ,, ,, ,, ,,

The latter figure compares with an average for the year of 0·225 per cent. with the inclined retort-settings at Mariendorf.

An Italian Concrete Water-Tower.

A reinforced concrete water-tower has been constructed for the St. Salvi Insane Asylum near Florence. The elevated tank has a capacity of 13,200 gallons; but this can be doubled without overstraining the tower. According to some particulars in "Engineering Record," the foundation is a hexagonal block of reinforced concrete 20 ft. 8 in. in maximum diameter and 8 inches thick, resting on a gravel foundation 14 ft. 6 in. below the ground. Several feet of very lean concrete are placed as the base, and this is covered with earth. From each corner of this base a column is carried up vertically to a reinforced concrete ring at the ground surface. From this ring to the bottom of the tank, the tower rises a height of 55 ft. 8 in. The posts of the lowest tier of the tower rake inwards somewhat, and are 16 ft. 5 in. high. The three remaining tiers are vertical, and each is about 13 feet high. The tank itself is of the Intze type. The outer shell has a diameter of 15 ft. 3 in. and a thickness of 3·15 inches; while the inner shell is 2 ft. 9 in. in diameter. The total height of the tank to the roof is 20 ft. 4 in. In designing the structure, it was assumed that the most unfavourable condition as respects stability was when the tank was empty and the wind exerted a horizontal pressure of 20½ lbs. per square foot on a flat surface and two-thirds of this amount on the plane projection of a cylindrical surface. The steel is subject to a tension of 14,200 lbs. per square inch, and the concrete to one of 425 lbs.

PYROPHORIC ALLOYS.

Automatic Ignition of Gas-Burners.

The property of yielding pyrophoric, or spontaneously inflammable, particles when rubbed with a hard object, which is often thought to be characteristic of the rare-earth metals, is not actually possessed by them in the pure state, and is rather a sign that the respective elements are impure. When they are alloyed with other metals, more particularly with iron, the power of producing sparks on friction appears—growing as the proportion of iron increases, to a maximum of about 30 per cent. and then falling again, to disappear finally when the iron amounts to 75 per cent. At or about the most effective proportion of iron, the alloys give off showers of sparks when lightly rubbed, and the sparks ignite combustible gases, fuses, or wicks saturated with alcohol, without fail or appreciable delay. If the alloys are rubbed more severely, the pyrophoric display takes the form of a flame apparently as large as the hand, which is only accompanied by a little heat or smoke.

It has also been found that the pyrophoric alloys, unlike the metals of the rare earth in them, are hard, brittle, almost completely permanent in air, and capable of being worked with a file without filling up the cuts. The iron can be partly replaced by nickel, cobalt, or manganese, or by mixtures thereof; but a complete absence of iron renders them practically inert. There is a certain difference in behaviour among the alloys according to the rare earth metal present. Lanthanum alloys exhibit the brightest light effects; those of cerium give the most pyrophoric sparks. Nevertheless, the differences are not important; and the alloys can be prepared from mixtures of the rare metals. An alloy composed of about 50 per cent. of lanthanum, 30 per cent. of a mixture of neodymium, praseodymium, and cerium, with 20 per cent. of iron, emits a most brilliant light; an alloy of 60 per cent. of cerium, 10 per cent. of other rare earth metals, and 30 per cent. of iron, produces sparks copiously.

It is easy to use an alloy of the latter type to construct a self-igniting incandescent gas-burner; the alloy being held in a suitable position, and rubbed by a moveable attachment fixed to the burner-cock. An alloy of the former type might also be employed as a flash-light in a lighthouse; the substance being fixed in the focus of a concave mirror, and rubbed at the proper time, with any requisite degree of severity, by mechanism operated even from a distance. The alloys, the "Journal für Gasbeleuchtung" reports, are being prepared in the Welsbach factory at Treibach in Carinthia.

NULLIFICATION OF THE GERMAN SELF-CARBURETTING PATENT.

As briefly mentioned on p. 154 of the "Journal" for Jan. 17, 1905, the German patent No. 130,112, taken out by Professor Vivian B. Lewes for "A Process for Leading Water Gas and the Like through Coal-Gas Retorts," the application for which was dated April 27, 1900, was declared invalid on Dec. 8, 1904, by the Nullity Division of the German Patent Office, and an appeal against that decision was rejected on Dec. 9, 1905, by the First Civil Court of the Imperial Court of Justice. Both judgments having since been published *in extenso* by the "Journal für Gasbeleuchtung," we are able to give the following account of the proceedings.

The essential claim in the contested patent reads: "In the process of leading water gas and the like through coal-gas retorts, a regulation of the amount of water gas introduced in such fashion that a sufficient degree of dilution and accelerated escape of the gas may be attained at the time when those portions of the coal gas are being evolved which would otherwise be converted into naphthalene and the like through their prolonged contact with the hot retort surfaces." The action being for nullification of the patent grant, the firm of Julius Pintsch, of Berlin, was the plaintiff before the Patent Court, and the respondent before the Court of Appeal; Herr J. E. Goldschmidt, of Frankfurt-am-Mein (as representative of Professor Lewes and the owners of the patent), being the original defendant, and the appellant on appeal.

The plaintiff's argument was that the claim expressed an object to be achieved, not a method of achieving it; that, although it hinted that the water gas should be introduced into the retort during a certain phase of the carbonization, the applicant did not until October, 1900, explain that the introduction should take place at the close of the carbonization, whereas in April, 1902, he stated that it should take place during the middle, and not at the end or the beginning, of the carbonization; that at gas-works (*e.g.*, Güstrow) built by the Dellwik-Fleischer Syndicate, owners of the patent, the introduction takes place during the first four hours of a six-hour run; that the process is, therefore, identical with that described in the German patent No. 1070 and the British patent No. 2725, of 1875; that in the "Journal" for June 16, 1903, Lewes had mentioned that White employed the method of leading water gas through coal-gas retorts in and also before 1850; and that in the "Journal" for May 5, 1903, Young had stated that the process was identical with the one protected by himself and Aitken in the year 1875.

The defendant rejoined that the specification of the contested

patent contained the data requisite for working the process—*i.e.*, that the proportion of water gas introduced should be 50 per cent. of the coal gas evolved when cannel is carbonized, and 20 to 30 per cent. in the case of common coal; that the claim said when the introduction should take place; that the process differs from that of Aitken and Young by its limitation of the period of introduction; and that as regards the Güstrow system of working it, the heavy hydrocarbons are evolved from cannel coal during the first stage of the carbonization, but not until after the first quarter of an hour from Westphalian and Bohemian coal; wherefore the period of introducing water gas must be changed to suit the conditions prevailing. Defendant prayed that should the claim be considered inaccurate, leave might be given to amend (enlarge) it in the spirit of the applications made to the Nullity Court.

After further arguments, the Court decided that the grant must be annulled on the following grounds: If it be admitted that the claim covers an introduction of water gas during a limited period of the carbonization process, there is a want of agreement between the claim, the specification, and the various answers to the interrogatories put in. The specification first says: The water gas should be passed in "during the distillation," secondly at the "back of the retort," thirdly "always" in quantities representing 30 or 50 per cent. (respectively) of the coal gas evolved, and later on does not say it should not be introduced throughout the whole period. The answers further specify as advantageous that the water gas shall be hot, shall be used in certain proportions (as aforesaid), and shall be free from steam; but do not—nor do the six claims lodged with the first answers—lay down precisely, or even indicate, the limited period of the carbonization during which the introduction shall take place. Arising from the earlier answers, it appears that the introduction can only be dispensed with during the first half of a six-hour carbonization; whereas a subsequent claim asserts that the process is for the use of a particular amount of water gas or the like. For these reasons, and on further grounds which were also taken by the Court of Appeal [see below], the patent was declared invalid.

The Court of Appeal rejected the application for a reversal of the lower judgment on the following lines:

To a technical man acquainted with the position of the gas industry, the process it is desired to cover by the contested patent appears to consist in a combination of four features: (1) The production of the water gas by the Dellwik-Fleischer method; (2) storage of the water gas in an intermediate holder; (3) addition to the coal gas as diluent of 50 per cent. of water gas when cannel is carbonized, and of about 20 or 30 per cent. when ordinary coal is used; (4) introduction of the water gas at the time when these constituents of the coal gas are being evolved, which would, in its absence, be converted into naphthalene and the like. Now, although it is permissible to read a claim by the light of the accompanying specification, it is not lawful in so doing to divest the claim of its own proper meaning. The first three of the above-mentioned points are not even indicated in the claim; and although they appear in the specification, they cannot be regarded as integral parts of the invention. By saying that the water gas is "preferably" made by the Dellwik-Fleischer process, the patentee shows that he does not wish to limit himself to the use of water gas made by this particular process. And although the specification states, with a certain degree of precision, the quantity of water gas to be used, there is nothing in the nature of an invention in a merely qualitative definition of a method already known. Hence only point No. 4 remains.

There is nothing new in the broad notion of introducing water gas into a coal-gas retort. The patent claims to prevent the formation of naphthalene and other objectionable hydrocarbons by diluting the coal gas to "a sufficient degree" with water gas at a time when the products of carbonization are liable to suffer such undesirable decomposition. But the plan of introducing water gas with the object of protecting certain coal-gas constituents from suffering decomposition at the particular time when the constituents are being evolved in the retort, is too obvious to be capable of being regarded as an invention. Apart from this flaw, the prescription that the water gas shall be introduced at the time when the coal-gas constituents are being evolved which are liable to decompose, presupposes that the maker knows at what stage of a six-hour carbonization period the constituents are evolved. Such a supposition, however, is at least so far untenable that the patentee is shown by the earlier proceedings to be unaware of it himself. In his answer of Oct. 17, 1900, he says that the introduction "is usually unnecessary at the beginning" of the carbonization, but must take place "in constantly increasing proportion towards the end of the distillation;" whereas on April 22, 1901, he intimates that the introduction is not needed during the first half-hour or so when the evolution of gas is violent, nor during the final stage when a gas is produced that is not liable to be decomposed by heat into naphthalene. Moreover, the patentee has himself abandoned the argument that the invention consists in a definition of the time when the water gas should be introduced, by saying that it is perfectly obvious, and a well-known principle, that the introduction should take place during the period when the heavy constituents of the coal gas are being evolved. Hence the judgment of the Lower Court, that the application contains no tangible invention, must be sustained. The claim expresses nothing but an object that it is desired to attain—a problem that had been propounded long previously. Methods for achieving the object in view are not given.

WAVERLEY ASSOCIATION OF GAS MANAGERS.

Proposed Scheme of Reconstruction.

The Ninetieth Half-Yearly Meeting of the Waverley Association of Gas Managers was held in the Cross Keys Hotel, Peebles, on Friday last—Mr. J. TULLOCH, of Loanhead, in the chair.

Mr. A. BELL, jun. (Peebles), in the name of Provost Ballantyne and the rest of the Gas Commissioners, thanked the Association for the honour they had done the town in coming there that day. He wished, in the name of the Provost and town councillors, to give them a very cordial welcome to the ancient and Royal Burgh of Peebles.

Mr. W. BROWN (Lasswade) returned the thanks of the Association for the welcome which had been extended to them.

The PRESIDENT then delivered a short address, in the course of which he said he was not going to give them a paper upon the manufacture or distribution of gas, as had been customary at these meetings. It was his intention to devote the short time at their disposal to the affairs of—he might almost say the life or death of—the grand old Waverley Association, the parent Association of the country. He considered this a very important matter indeed. As they were aware, there had latterly been a great falling off in the attendance at their meetings; and he was sorry to say that this falling off had been most observable among those who should take the greatest interest in the welfare of the Association—the gas managers of the Waverley district. He confessed, however, he was not without sympathy in the matter towards some of his brother managers, especially those in small works, some of whom had long and inconvenient journeys to make in order to attend the meetings. The question of expense must also not be overlooked. To a man with a small salary, and much to do with it, this item entered as largely into the matter as the question of the time taken in getting to and from the meetings. A great change had taken place since the Waverley Association came into being. Managers could now attend meetings with less restraint of speech than was formerly the case. Very few of the original members of the Association were now left; and times had greatly altered. There was not now the same exclusiveness. Thanks to a greater feeling of comradeship, due in large measure to these meetings, the hard, rocky crust of jealousy, secrecy, and dislike had been broken up; and they had entered into a deep, rich, and fertile soil, where gas managers were working together in good fellowship, and sending forth new shoots, as it were, until they met and grasped the right hand of friendship the world o'er. Their Association was started 45 years ago. It had embraced in its membership many names which were dear to them all, either of personal friends or of gentlemen known by reputation. He asked them to make a determined effort to raise the Association to that state of prosperity which it deserved. There were several points he would like to put before them for their consideration, with a view to placing the Association upon a firmer basis. These were: (1) Should they have but one meeting annually, instead of two? (2) Should they meet at a fixed centre annually, instead of at two different towns every six months, as had been the case hitherto? (3) In what month should they meet? (4) Should members pay a small annual subscription? (5) Should a Committee of four be appointed to draft a circular, to be sent to all gas companies and corporations in the district, asking them if they would kindly bear the expenses of their managers in attending the meetings, and giving reasons for the appeal? If they fixed their centre, say in Edinburgh, it was a straight line thither from all parts of the Waverley district; and there were many places of interest in Edinburgh which they could visit.

Mr. A. BELL, sen. (Dalkeith), characterized the question as a most momentous one for the Association. He remembered the birth of the Association; and he had followed with interest its progress all through. Things were different now from what they were in the old days. They had not a Technical Press then, as they had to-day. Junior Associations now, too, took away the interest from older bodies. He agreed, therefore, with the President, that they should have only one meeting in the year. As to the defraying of expenses, he observed that sanitary inspectors were being sent to technical meetings at the cost of their employers; and gas managers should be similarly treated. He thought the payment of a small subscription was necessary. They had had no funds hitherto; and they had had nothing to work upon. He thought April would be the best month in which to meet, as they could then compare notes as to where they felt the pinch during the winter.

Mr. A. MACKENZIE (Edinburgh) supported the proposal.

Mr. W. BLAIR (Helensburgh) suggested that the spring meeting might be held in Edinburgh, and the autumn meeting in the country.

Mr. H. O'CONNOR (Edinburgh) thought that the ideas suggested were very admirable, and should help the Association to do good work, as it had done in the past.

Mr. J. GEMMELL (Melrose) suggested July or August, or even September, as the month in which to hold the meeting.

Mr. A. C. YOUNG (Arbroath) was afraid that what was proposed was a departure from the original objects of the Waverley Association.

Mr. FORBES WADDELL (Queensferry) supported the idea of

meeting in places like Peebles, where there were so many attractions. It was not so much what they heard at the meetings that benefited them, as what they learned from brother managers in conversation.

Mr. W. Brown (Lasswade) said he thought the North British Association did something in the way of approaching the directors of companies as to the payment of expenses; but it came to nothing. As a number of the members were not present, he proposed that a Committee of four be appointed to ascertain, by means of reply postcards, the views of the others upon the proposals which had been put forward.

Mr. T. Lighbody (Renfrew), though not qualified to address the meeting upon the subjects before them, mentioned that he was the originator of the question as to the payment of the expenses of managers attending such meetings as the North British Association. They had only fourteen favourable replies. He must say that he enjoyed coming to the Waverley meetings now and again; and the Association would be well advised if they spread their net a little farther than the Waverley district, so as to include, as extraordinary members or otherwise, some who lived outside the district.

Mr. A. Bell, jun. (Dalkeith), thought that if their expenses were to be paid, it did not matter where the meetings were held. To fix that the meetings should take place in Edinburgh, would be to defeat the very object of the Association. For instance, they had come to Peebles to see a new gas-works. They could not see a new gas-works in Edinburgh every year.

Mr. Brown's motion was then adopted; and the following were appointed a Committee: The President and Secretary; and Messrs. A. Bell, sen., Gemmell, Tulloch, and Forbes Waddell.

Mr. A. Bell, sen., proposed, and Mr. F. W. Carlow (Renton) seconded, that Mr. W. Young (Penicuik), the Secretary, be appointed President. This was agreed to.

Mr. Gemmell proposed, and Mr. A. Bell, sen., seconded, that Mr. W. Brown (Lasswade) be appointed Secretary; and this was also carried.

Thereafter Mr. Gemmell presented Mr. Tulloch with the President's Medal of the Association; and this having been acknowledged, the meeting terminated with votes of thanks to the retiring President and Secretary.

The members and friends, to the number of about forty, dined together in the hotel—Mr. Young presiding. The toast of "The Gas Commissioners of Peebles" was proposed by Mr. W. Blair, and acknowledged by Mr. A. Bell, jun. Mr. A. H. Hamilton, of Hamilton, proposed "The Waverley Association of Gas Managers," which was acknowledged by Mr. A. Bell, sen.

Through the kindness of the Peebles Gas Commissioners, the Company were driven to the new gas-works belonging to the Corporation, where they were welcomed by Mr. W. H. Williamson, the Gas Treasurer. Mr. Bell showed the party over the works, which were in first-rate order, and were greatly admired. Before leaving, votes of thanks were accorded to the Commissioners and to Mr. Bell for the privilege of the visit.

Electrical Manufacturers' Association and Exhibitions.

In the report of the Committee of the Electrical Manufacturers' Association for the past year, the following paragraphs appear:

Early in the year, the Electrical Exhibition, which took place in the month of October at Olympia, was originated by your Committee, who took an active part in the management and carrying through of the exhibition, and were fully rewarded by its decided success, not only from a financial point of view, but from that of the exhibitors and the members of the Association generally. It being felt that local exhibitions held in various parts of the United Kingdom were prejudicial to the interests of your members, it was agreed, and the members pledged themselves, not to exhibit at local or country exhibitions through 1905-6, unless upon the terms agreed upon by the members of the Association—viz., that they could loan their manufactures for such exhibitions, but that the authorities must free them from all costs, whether for space, current, carriage, or damage to material. The Association in organizing the Electrical Trades' Benevolent Institution has met with considerable support. Further circulars on the matter of Christmas boxes and beanfeast subscriptions have been sent out; and it is hoped that in course of time these irksome taxes may be abolished entirely.

Mr. W. Davenport, the Secretary, states that the financial result of the Olympia Exhibition is a profit balance of £3683; and after returning to all exhibitors a rebate of 25 per cent. on the amounts paid by them for space, which absorbed a sum of £2168, there remains a balance of £1515 7s. 10d., which has been dealt with as follows: A donation of £350 has been made to the Benevolent Fund of the Institution of Electrical Engineers, instead of £250 as previously announced. A donation of £650 has been made to the Electrical Trades' Benevolent Institution, under the auspices of the National Electrical Manufacturers' Association. The balance of £515 7s. 10d. will be invested in the names of trustees to form a nucleus of a fund for starting another Electrical Exhibition, which must be held in London under the auspices of the Institution of Electrical Engineers. In the event of no such exhibition being held within five years, this balance to be divided between the two benevolent funds above mentioned, in the same proportions as now allocated.

YORKSHIRE JUNIOR GAS ASSOCIATION.

A Meeting of the members of this Association was held at the Town Hall, Dewsbury, on Saturday, under the chairmanship of Mr. E. J. Sutcliffe, the President. The meeting having been formally opened,

Mr. G. Herris (Redcar) read a paper entitled—

A FEW NOTES ON UNACCOUNTED-FOR GAS.

By way of preface, the author pointed out that unaccounted-for gas was the difference in the quantity made as registered by the station meter and that accounted for in the company's books. It was an item which engaged the attention of all gas managers, and often caused much worry, especially where the amount was excessive. Roughly, every 5 per cent. of leakage might be taken as a loss of about 1d. for every 1000 feet of gas made; extra coal, labour, &c., being required. Therefore, though it was very difficult to decide how the percentage of unaccounted-for gas was made up, it was an item worth considering.

The amount of unaccounted-for gas, he said, was usually stated in percentage of the gas made; but the percentage at one works could not very well be taken as a criterion to another, as the nature of the districts supplied varied to a great extent, and the conditions of supply were not the same. As a large portion of the leakage was generally from the mains and services, it had been suggested by some that the amount should be stated in percentage per mile of main; and perhaps this would serve better for comparison. Take, for example, two works, each making the same amount of gas per annum, but one supplying a thickly populated district and the other a very wide and straggling area. It was easy to understand that the latter would have the larger percentage of leakage of gas made, owing to the extra length of main; but if the percentage was taken per mile of main, the probability was that the amounts would be nearer the same. Some of them might have noticed where a works had increased a good deal in make, that the percentage of leakage decreased. This was generally due to the fact that about the same length of mains was supplying the increased demand.

Station Meter.

Before going further to find where this discrepancy arose, it was first necessary to be sure that the station meter was registering correctly, and that the gas was being measured at about the same temperature as it would be by the consumers' meters. Dry gas, measured at 30 inches barometric pressure, decreased about 1 per cent. for every 5° Fahr. its temperature was reduced. He believed, taking the year round, that the gas was measured at a lower temperature at the consumers' meters than at the station meter. As to the water-line of the station meter, this should be kept at the proper level. It should also be borne in mind that some holders would give 2 or 3 inches more back-pressure than others; and this was bound to have a disturbing effect on the water-line. Again, there was always more or less moisture in the gas when passing through the station meter, and the greater portion of it condensed out either in the holders or in the mains.

Gasholders.

The gas in the holders was subjected to great variations in temperature; and in winter time it was without doubt reduced far below the temperature at the outlet of the station meter. Consequently, there would be a shrinkage in bulk. This, of course, was somewhat equalized by the higher temperature of the gas in the summer time; but would this fully compensate for the lower temperature in winter? Leaky rivets in the holders were often a source of trouble; and in summer time, owing to the expansion of the holder sheets, leakage would be greater than in winter. Leaky rivets could be easily found by brushing over with a solution of soap and water; and these should be attended to and remedied by caulking with white lead.

Mains and Services.

Fractured and damaged mains, said the author, were responsible for a large amount of leakage; and these might be caused by: (*a*) Electrolysis, (*b*) Heavy traffic, (*c*) Subsidence (made-ground—new streets), or (*d*) Decay (especially in made-ground).

Where electricity was supplied, every endeavour should be made to secure protection for the mains and services, which should be as far away as possible from the cables and rails. Where the cables or rails passed over mains, it was necessary to put a bed of asphalte or other insulating material over them for protection. As to fractures by heavy traffic, he suggested the advisability of laying mains at a sufficient depth (at least 2 feet) to be free from danger of this kind.

Subsidence of the soil, he remarked, especially where it was made-ground—such as in new streets, &c.—very often caused drawn and leaky joints. Some districts, being honeycombed with mine workings, were also often plagued very much through subsidence of the ground causing drawn joints and cracked sockets. In such places as these, a periodical search along the main for leakage, by the aid of a leak indicator, was found profitable. As the leakage on the mains took place chiefly at the joints, it was obvious that great care and attention should be paid, when the

pipes were being laid, to make good sound joints. With the open socket, the ladle should always hold sufficient lead to run the joint; and care should be taken in caulking it up. In laying bored and turned pipes, the joints were best made with either white lead or a mixture of red and white lead, as those made with red lead only were liable to crack sooner and cause leakage. Pipes should never be laid in ashes or chemical works refuse, as was often found in newly-made streets, without first well punning the ground to make a firm bottom, and embedding them in good soil procured for the purpose, or puddling them all round with clay. The upper side should have a thick covering; and on no account should the pipes be laid with clay only underneath, as when so placed the clay served to receive and retain the water, which, having passed through the ground, would have become charged with deleterious compounds. Pipes lying in this liquid would be destroyed sooner than if no clay at all were present. When branch-pipes were taken from live mains, more or less gas was always lost; but this could be reduced to a minimum by using one of the patent cutting machines now on the market.

Service-pipes were, the author said, generally acknowledged as a fruitful source of leakage. In taking service-pipes from the mains or branch-pipes, a drill should always be used for cutting the hole, and not a chisel. Then, again, a great deal depended on the nature of the soil service-pipes were laid in; for in some ground they would very rapidly decay. Service-pipes that had been in use for a number of years should be attended to whenever possible. Where the ground in which service-pipes were laid consisted of ashes, clinker, &c., it was advisable to lay them in rough wooden boxes and smother them in sawdust, and run in a mixture of hot tar and pitch. The extra initial cost of laying in this way was only slight, and the pipes were preserved, thus preventing leakage. Another cause of leakage from service-pipes was in the use of different makes of pipes and fittings at the same time; as, though manufacturers of tubes worked to one standard thread, there was some divergence in the size of the tubes. Therefore, if one maker's tubes were used with the fittings of another, the connection between the two was rarely perfect.

Pressure on Mains.

This was an important item; and while it is necessary to give every consumer sufficient to supply his needs, the pressure on the mains should not be in excess, and should be carefully regulated during the day, at such times as were found necessary to meet the increasing demand. The author stated that he had known two cases where, by supplying gas at a higher pressure than was really necessary, and not regulating it often enough, heavy leakage accounts resulted. "Newbigging's Handbook" said: "By doubling the amount of pressure, the consumption of gas is increased by about one-half. Leakage from a pipe is, of course, increased in the same ratio—*i.e.*, in the proportion of the square root of the pressure;" and also that the "maximum pressure in a district should never exceed 20-10ths during the heaviest consumption." If part of a district suffered from an insufficient supply, it would generally pay to replace the branch-pipes, or at all events part of them, by larger ones, rather than increase the pressure on the whole district.

In hilly parts, it was often necessary to put district governors at suitable places, to regulate the pressure of gas; otherwise there would be greater leakage through any faulty main or service pipe, owing to the excessive pressure that would obtain at the high-lying portions of the district. It was not, however, always found practicable to use district governors, as in a case the author was acquainted with they had to be removed to allow branch-pipes to be taken from the main to supply low-lying areas beyond. Thus some extra gas would no doubt be lost.

The Public Lighting Account.

After a few remarks on the loss experienced through defective consumers' meters, and advocating the testing of every meter (say) once in five years, Mr. Herris said that all gas used in the works, offices, &c., should be registered, and not guessed. He then referred to the public lighting account. Where, he said, the average meter system was in vogue, the lamps with meters attached were supplied with gas that had to do work in rotating the meter, and would not consume so much as those without a meter to impede the flow. Of course, if governors were used on all lamps, together with the average meter system, and the governors were periodically tested and adjusted, the plan became a good one. But without governors in use, the pressure varied a good deal along the main, and the gas charged for was likely to be far below what had actually been consumed. With governors only in use, the governors ought to be tested and adjusted at least once every twelve months. The number of lamps with each size of governor in use should be ascertained, and the amount of gas used during the lighting season carefully worked out. Where so much per lamp per annum was charged, and the lamps not to be lighted on moonlight nights unless cloudy and dark (this being left to the discretion of the lamplighters), these extra nights were often not taken into consideration; but, in order to obtain an accurate public lighting account, a good lighting table should be drawn up and strictly adhered to. Also every lamp should be provided with a governor.

Discussion.

Mr. F. Scholefield referred to the difficulty of making fair comparisons between the leakage accounts of different works owing to the wide diversity of local circumstances. He pointed out that one works might supply a flat district of limited extent, another a mining district where subsidences were frequent, while a third might have a distributing area having great variations of altitude. In three such works as these the chances of leakage would vary greatly, and no just comparisons could be instituted. He agreed that much depended upon the degree of condensation carried out on the works, as an unduly large make might thus be easily registered; while in high-pressure distribution, or any excessive rise in pressure, there would be a tendency to consequent condensation and loss of volume. Leakage from holders might arise from other causes than loose rivets. Corrosion led to it, and so would the gradual deterioration of the cups; while in some works, in which there was an unfortunate shortage of holder accommodation, gas was known to blow for want of anywhere else for it to go. Greater discretion in the choice of gas-meters—using dry or some specially adapted wet meters for high altitudes, dry meters for warm places, and wet ones for damp ones, and so forth—would modify many a leakage account. He questioned the references to variations of holder pressure, and doubted if they would make any difference to the registration of a station meter.

Mr. Hill called attention to some published statistics which revealed greater actual loss in summer than in winter, and suggested that in many of these cases the moist and heavy soil of winter would act as a kind of luting in preventing escapes, which more readily happened through the loose dry soil in summer.

Mr. Fligg thought that any error arising from guessing instead of measuring the consumption on the works would form but a very trifling fraction of the total make; while few managers would allow themselves to guess it much too low. He was strongly of opinion that the two most important items were inaccurate meters and erroneous estimation of the consumption of public lamps. In a large number of cases when these were tested, they were found to be consuming more gas than was estimated, and an excess of 0·5 or 0·25 cubic foot per hour assumed large proportions when multiplied by the number of lamps and the lighting hours per day and the number of days per annum. Another important aspect of the consumption in street-lamps was the loss arising from inaccuracy in timing the lighting and extinguishing. A careless lamplighter would generally err, when he did err, in the direction of lighting too soon and putting out too late; while errors in the same direction would arise from a man having more lamps to attend to than he could get through in the time expected of him.

Mr. Booth said he believed that probably one-fifth of the unaccounted-for gas was to be met with in pumping the syphons. The gas would leave the holders heavily charged with water vapour. Much of this would be deposited as the result of the lower temperatures which the gas would meet in the mains and services, and thus cause a decrease in the volume of gas. This shrinkage would entail a further deposition of the portion of the various hydrocarbons in excess of the quantity which the lessened volume could hold as vapours.

Mr. C. Roper thought Mr. Herris must have underestimated the extent to which the chisel was used in preference to drilling in making a service connection. He said his experience pointed to a widespread preference for the former method.

The President closed the discussion by quoting various published statistics as to the relative temperatures of the gas at the station meter and at the consumers' meters. He gave the result of long and elaborate tests he had made in more than one town revealing the lower temperature to be at the former point. He said he should like to have further details as to successful caulking of loose rivets with white lead. He knew how very difficult it was with red lead, and greatly doubted its possibility with white lead. He noted the reference in the paper to pressure not exceeding 20-10ths; but he pointed out that many cases could be found where the total leakage was less than 5 per cent., though pressures varying between 40-10ths and 55-10ths were common. Reference had been made to wrought-iron services only. These were, of course, the commonest; but lead pipes, laid as suggested in wooden troughs, &c., were in use in not a few places, and, notwithstanding higher cost, had many counterbalancing advantages. They were more quickly run, and lasted longer.

On the proposition of Mr. Lister, seconded by Mr. Lumb, Mr. Herris was heartily thanked for his paper.

THE QUESTION-BOX.

The discussion of some questions left over from the last meeting was then proceeded with. As on the previous occasion, keen interest was maintained, and speakers followed one another in rapid succession.

Carbon dioxide in coal gas reduces the flame temperature. Is the effect the same in the case of a bunsen flame as in a luminous flame?

Mr. Booth pointed out that the action of carbon dioxide in each case was a diluting one resulting in (*a*) a larger volume of gaseous products to be heated, and thus a greater loss of the heat primarily generated; and (*b*) the combustible particles had a greater distance to travel to secure enough oxygen for complete combustion. Consequently, a larger flame was formed, and necessarily a larger radiating surface, and so there was a greater

loss of heat. Any other diluent except oxygen would act in the same way. Mr. Ingham remarked that as carbon dioxide was incombustible, when present in coal gas it absorbed a definite amount of heat, however the gas might be burned. Its markedly deleterious action was due to its specific heat being higher than that of most gases—*i.e.*, 0·3307, while that of nitrogen was 0·2370 and of oxygen 0·2405. In an ordinary luminous flame there were three distinct parts—a blue region at the base, the yellow light-giving portion, and the faintly luminous mantle enveloping the whole of the cone of the flame. These three parts constituted the actual area of combustion, and enclosed a dark region of unburnt gas. The gases ascending this dark region were surrounded by burning material, and were raised in temperature to a point at which methane and ethylene decompose to form hydrogen and acetylene. The following table, by Professor V. B. Lewes, showed the gradual development of acetylene in such a flame :—

	Total Unsaturated Hydrocarbons. Per Cent.	Acetylene. Per Cent.
Gas in burner	4·38	0·035
½ in. above rim of burner	4·00	0·340
1½ ,, ,, ,,	1·53	0·560
Tip of dark region	1·98	1·410
Centre of luminous area	0·45	0·045
Tip ,, ,,	0·00	0·000

Supposing a large percentage of carbon dioxide was introduced into the gas, during combustion it was heated to a high temperature before leaving the flame, and reduced the flame temperature in proportion to the amount present. This reduction of temperature consequently reduced the rate at which the acetylene produced by the decomposition of the hydrocarbons was split up, and the number of carbon particles heated to incandescence was reduced accordingly. The speaker went on to say that another part played by carbon dioxide was that it not only diluted the gas, but retarded combustion by keeping away the air to a certain extent from the burning gas. The flame was thus enlarged, and consequently was of lower intensity. Experiments by Professor Lewes upon the actual temperatures of various regions of a bunsen flame rendered non-luminous by admixture with different gases were given in the following table, and showed how powerful was the cooling action of the carbon dioxide :—

Temperature, in Degrees Fahrenheit, of a Bunsen Flame Burning 6 Cubic Feet of Gas per Hour.

Region of Flame.	Luminous Flame.	Flame Non-Luminous by the Addition of		
		Air.	Nitrogen.	Carbon Dioxide.
½ in. above burner	275	129	86	95
1½ ,, ,, ,,	790	347	231	158
Tip of inner cone	1675	1994	831	739
Centre of outer cone	2422	2791	1830	1418
Tip of outer cone	1342	2147	2103	1743
Side of outer cone level with tip of inner cone	2256	2431	2256	1778

Is there a specific relation between flame temperature and calorific value? If so, could not a direct-reading calorimeter be designed based upon this relation?

Mr. Stephenson opened the discussion of this question by pointing out that there was no such specific relation. He said any gas had a definite calorific value—*i.e.*, by whatever method and under whatever conditions it was burned, no matter at what rate. So long as it was completely burned, the number of heat units liberated from a given volume (corrected for temperature and pressure) would be the same; whereas the flame temperature altered according to the rate of consumption and the conditions under which it was consumed. Moreover, the temperature varied greatly in different parts of the flame, both as regarded the horizontal distance of the points in question from the outside of the flame and their vertical distance from the burner. The extreme difficulty of estimating the temperature of a flame with any degree of accuracy had been demonstrated by Professor Smithells at the first meeting of the Association. This difficulty was increased by the uncertainty as to whether the flame was quite steady. A direct-reading calorimeter based on flame temperature was, therefore, out of the question; and no other basis for one seemed to have been suggested. Mr. Booth agreed in the main with what the last speaker had said; but he deprecated too sweeping a declaration of there being absolutely no relation between the temperature of a flame and the calorific value of the burning gas. In his opinion there was a relation, but not a simple one. The temperature of a flame depended on: (1) The calorific value of the gas, (2) the portion of the flame tested, as the temperature varied in different parts of the flame, (3) the total mass of the products of combustion per unit of gas, (4) the mean specific heat of these products, (5) the size and character of the flame and consequent loss of heat by radiation. As an illustration of what he meant, Mr. Booth said he had calculated the theoretical rise in temperature of the products of combustion of two gases requiring very different quantities of air for their complete combustion—viz., benzene vapour (C_6H_6) and hydrogen. The calculations were made on the assumption that the combustion was instantaneous and homogeneous.

Substance.	Net Calorific Value. Per Cub. Foot.	Net Calorific Value. Per Pound.	Weight of Products of Combustion from 1 Cub. Foot.	Assumed Specific Heat of Products.	Theoretical Rise in Temperature.
	B.T.U.	B.T.U.	Lbs.		Deg. Fahr.
Benzene	3574	18,183	3·009	0·240	4945
Hydrogen	294	52,000	0·1984	0·245	6190

Comparing the rise in temperature and the calorific values per cubic foot and per pound for the two cases, we get the following ratios:—

	Benzene.	Hydrogen.
Rise in temperature	1	1·252
Calorific value per pound	1	2·750
,, ,, per cubic foot	1	0·082

From these figures it would be seen that the temperature of a flame did not bear a lineal ratio to the calorific value of the burning gas. In addition to this, the extreme difficulty of accurately determining the temperature of a flame, either by the electrical resistance or the thermo-couple thermometer, due to the radiation of heat from the wire, our very limited knowledge of the specific heats of gases at high temperatures, and the difficulty of correcting for the heat lost from a flame by radiation, rendered such a method of arriving at the calorific value of the gas impracticable—in fact, a direct-reading calorimeter on this principle was an impossibility. Mr. Ingham reminded the members of the lecture delivered to the Institution of Gas Engineers last May by Professor Smithells, in which he pointed out that there was no definite relation between flame temperature and calorific value, and that though gases of different composition might have the same calorific value, the rates of oxidation might differ.

Should house-fittings be inspected and the gas followed to the burner?

The first speaker on this question was Mr. M'Nab, who referred to the danger of inferior and unsuitable fittings being inserted as a result of cutting competition, and emphasized the need of checking such practices if satisfaction was to be secured in connection with gas lighting and heating. He called attention to the prevalent greater or less leakiness of taps, and the importance of safeguarding against evil results therefrom, especially as water gas was nowadays often mixed with coal gas. Mr. Scholefield agreed that this was everywhere an important question. Many complaints were heard, which on investigation revealed such neglect in regard to fittings as the continued use of burners twenty years old, &c. An inspector for house-fittings could easily secure greater satisfaction with the gas supply. The chief obstacle seemed to be the fear of local plumbers that weighed so heavily with local authorities. Mr. C. Roper, on the other hand, uttered a note of warning against a too ready incurring of extra liability. He said that at present gas suppliers' liability generally ceased at the meter, and any attempt on their part to carry out the interior fitting of houses, or even the inspection and passing of other people's work, might involve large and unwelcome responsibility. He approved of the maintenance of incandescent burners; but with regard to fittings, he would advocate the insertion of a clause in the Local Act giving full power to stipulate as to sizes, &c. Mr. Ablett mentioned that the new Act of the Rotherham Corporation gave the Gas Committee power to inspect and pass fittings, and to specify the sizes of pipes that must be employed for various numbers of lights, &c. Mr. Lister spoke of the difficulty of getting architects and builders to groove the walls for sufficiently large pipes. He said that rather than do this, they would use pipes of too small a bore, so that the plaster could cover them. He should like to see all pipes together in a groove, so boarded over as to be easily accessible. Mr. Booth pointed out that he would be obliged to exclude electric light cables from such a collection of pipes. Mr. Parrish mentioned recent discussions where prominent gas engineers had disagreed widely as to the advisability, from a financial point of view, of the supervision suggested, though all would admit the desirability of giving general satisfaction by getting the best value out of the gas used. The President said that most corporations had power to enact and enforce bye-laws, and that there was abundant opportunity in this direction for much more vigorous action than had been usual in the past. Mr. Roberts pointed out that an inspector would be much more useful if he also had men under his direction to do necessary work; and as such work would be paid for, the financial aspect of the subject did not matter so much. Mr. Hill said this side of the question must be settled by experience. In York they had done fitting work themselves ever since the foundation of the Gas Company in 1844, though they did not by any means seek to do all, or even most, of such work as became necessary, as this would involve an enormous staff.

A gas undertaking supplies gas to public lamps belonging to an outside local authority at a consumption of (say) 4 cubic feet per hour, and doubt is expressed as to that quantity being supplied. What course might be adopted in order to prove to the local authority that the quantity is actually being supplied?

Mr. Fligg gave his experiences of such a difficulty with two outside authorities, which had been met by testing from 15 to 20 lamps in each district with an experimental meter in the presence

of officials and councillors of the authorities in question. The proceedings threw much light on the possibilities of a leakage account. In each case burner governors were in use, set to pass 4 cubic feet of gas per hour. One set actually averaged 4·4 and the other 4·25 cubic feet. As upwards of 400 lamps were concerned, the total excess was of importance. Similarly, he had found incandescent burners actually consuming 4·15 cubic feet, while only 3·5 cubic feet were paid for. Some of this trouble arose from old governors; while unauthorized meddling with these appliances by lamplighters wanting to get a better light, was not absolutely unknown to him. Mr. Parrish and Mr. Ablett confirmed this experience in regard to governors, which, on testing after long use, were found to give an unduly large supply of gas; while Mr. Lister and Mr. Ingham spoke of tests made by a disc float tester in cases where the gas authorities were not allowed to remove the governors for examination.

This concluded the business of the meeting.

PHOTOMETRY OF HIGH-POWER LIGHTS.

(*Concluded from p.* 174.)

The Use of Screens.

When high-power lights are being tested with the aid of dispersing lenses, it is of the utmost importance that no stray light reflected from walls or ceiling, or from objects in the photometer-room, shall reach the disc. On a previous occasion, the author described the result of testing a particular intensified gas-light which actually developed a light of 544 Hefners. When one of three different dispersing lenses was employed, the figures came out as 777, 1063, and 1693 units respectively. The intensity of any reflected light which may reach the disc might appear too faint to produce such great errors; but it must be remembered that stray light increases the value of the final component in the equation—

$$J = J^{\circ}\frac{a^2}{b^2}\cdot\frac{c^2}{z^2};$$

so that its effect becomes multiplied by the value of $\frac{a^2}{b^2}$.

In order to ascertain directly the magnitude of the errors introduced in this fashion, the following experiments were carried out: The photometer was erected in a room having walls and ceiling painted a dark colour. Three dispersing lenses, with negative foci of 30, 18, and 10 cm. (12, 7, and 4 inches), were employed; measurements being made, in duplicate, of a Welsbach burner, sometimes with and sometimes without a lens, and sometimes with and sometimes without screens on the photometer. The results were—

	I.		II.
(1) With screens; without a lens	78·2	..	86·5
(2) With screens; with a lens (mean)	66·9	..	74·3
(3) Without screens; without a lens	81·5	..	90·2
(4) Without screens; with the − 12-inch lens	86·9	..	59·1
(5) Without screens; with the − 7-inch lens	115·9	..	134·4
(6) Without screens; with the − 4-inch lens	189·0	..	219·6
(7) Transparency factor (2 ÷ 1)	0·856	..	0·859
(8) Strength of reflected light (3 − 1)	3·3	..	3·7

Now, when a lens is used, the effect of the stray light which reaches the disc, like that of the direct light, is multiplied by the dispersion factor $\frac{a^2}{b^2}$, which in the case under consideration is equal to 7·18 for the − 12-inch lens, 14·36 for the − 7-inch lens, and 34·8 for the − 4-inch lens. Hence if the strength of the stray light is multiplied by the appropriate factor, and the product is added to the corresponding photometric figure obtained when screens are used—value (2) above—the sum should sensibly agree with the values obtained without screens, provided stray light is the sole cause of the high reading. This is shown to be the case in the three following lines, which should be compared with 4, 5, and 6 above—

	I.		II.
(4a) Value (2) + (Value 8 × 7·18)	90·5	..	100·9
(5a) ,, + (Value 8 × 14·36)	114·3	..	137·4
(6a) ,, + (Value 8 × 34·8)	181·7	..	203·1

Inspection shows that only the last of these calculated values differs from the corresponding figure of observation by more than 4 per cent.

Similarly, returning for a moment to the exaggerated figures found for the intensified gas-burner mentioned above, the dispersion factors of the three lenses employed were 9·6, 19·8, and 50·4. Reckoning (in the absence of precise knowledge) upon the same amount of stray light as in the case of the Welsbach, inefficient screening of the disc might be calculated to give figures for the illuminating power equal to 764, 949, and 1703 Hefners respectively—which differ on an average by 3 per cent. from the values actually observed.

It is therefore evident that, when dispersing lenses are used in photometry, the utmost care must be taken to prevent any but direct light striking the observing disc; and this remark applies to the light passing through the lenses as well as to that reflected from the room or objects therein. The lights are best housed in boxes lined with black velvet, large enough not to interfere with the air supply or to affect the temperature; a hole being cut in each of sufficient dimensions not to mask any part of the flames. Between the lights and the discs a set of two to four velvet screens should be arranged, their apertures diminishing in size in the direction of the disc.

The Dioptric Disperser.

The dispersing lens may be placed anywhere between the observing disc and the source of light that has to be diminished in intensity; but it is convenient to arrange the disc and lens at a constant distance apart, and to cause the extent of the weakening action to be the same at all distances between the disc and the light in question. In the upper diagram of the annexed illustration, J is the high-power light and J_0 the standard; L is a lens

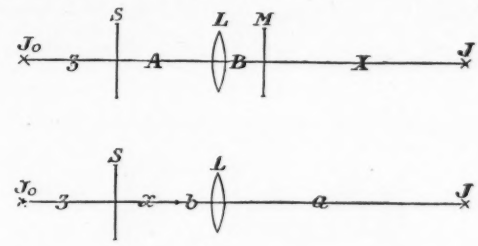


Fig. 4

throwing a sharp image of the matt screen M upon the disc S. If the image of M cast by L upon S is colossal, its intensity is correspondingly reduced; and if M is connected with S so that they move together, photometric observations of the value of J can be made by measuring the distance between J and M. In practice, however, as the second diagram shows, the matt screen is unnecessary. L is then fixed at a constant distance from S equal to A; the distance, B, of the point M at which the lens focuses the disc is measured; and from it the distance, X, between J and M is calculated. If the distance between J_0 and S is z—

$$J = J_0\frac{A^2}{B^2}\cdot\frac{X^2}{z^2}.$$

This formula is arrived at as follows: Employing the dimensions marked in the lower diagram, theoretical considerations for the action of dispersing lenses show that—

$$J = J_0\frac{a^2}{b^2}\cdot\frac{x^2}{z^2}$$

If the focal length of the lens is p, the introduction of A, B, and X gives—

$$a = B + X;\ b = \frac{a\,p}{a-p},\ \text{where } p = \frac{A\,B}{A+B}.$$

$$\text{Hence } b = \frac{(B+X)\,A\,B}{(B+X)\,(A+B) - A\,B} = \frac{(B+X)\,A\,B}{N}$$

$$\text{and } x = A - b = \frac{A^2 X}{N};\ \text{whence}$$

$$J = J_0\,(B+X)^2\frac{N^2}{(B+X)^2\,A^2\,B^2}\cdot\frac{A^4 X^2}{N^2}\cdot\frac{1}{z^2},\ \text{or}$$

$$J = J_0\,\frac{A^2}{B^2}\cdot\frac{X^2}{z^2}.$$

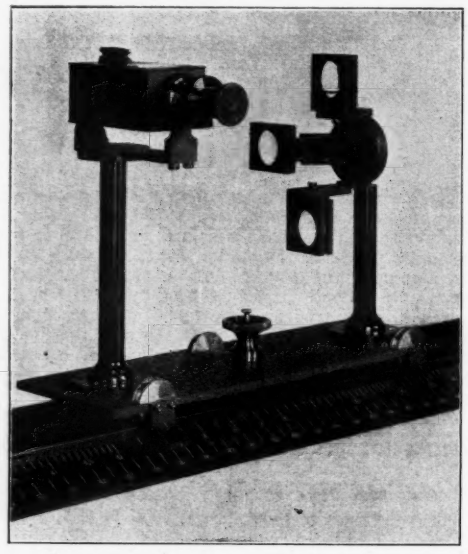
In practice it is convenient that the weakening action of the lens, and the distance A + B, should be round numbers; or, rather, since there is a loss of light equal to 1 − k in the lens, that the quantity $k\,\frac{A^2}{B^2}$ should be a round number. This would be difficult to arrange if only a single lens were used, as it would possess a fixed focal length. If, however, two lenses are so employed that the distance between them can be altered, the matter is simplified. Two sets of experiments were carried out in this fashion with a pair of lenses at such a distance from the disc that an object 30 cm. away was sharply focussed thereon—*i.e.*, that A + B = 30 cm.; the lenses being so supported that they could be made to touch or separated by a distance of 20 mm. In one experiment the lenses had (equal) focal lengths of 100 mm.; in the other, of 83·3 mm. The light of a Welsbach burner was then compared with that of a paraffin lamp with a pale blue chimney; the ratio of the illuminating powers being 31·3: 1. When the system of lenses was inserted in the path of the Welsbach rays, the results were—

	Distance Apart.		Relative Ill. Power.		Diminishing Factor.		k
Two 100 mm. lenses	0	..	1·90	..	16·5	..	0·84
Two 100 ,, ,,	20 mm.	..	2·62	..	12·0	..	—
Two 83·3 ,, ,,	0	..	1·08	..	29·0	..	0·86
Two 83·3 ,, ,,	20 mm.	..	1·49	..	21·0	..	—

Inspection of these figures shows that it is possible to find a distance between 0 and 20 mm. for the separation of the individual 4-inch lenses, at which distance their joint effect shall be to reduce the light passing through them to 1·15th of its original power; and similarly with the 3·3-inch lenses, to find a distance at which the light shall be dimished to 1·25th of its true brightness. The factor k shows that, on an average, 1 − 0·85 of the original light is dissipated by reflection and absorption about the lenses—viz., some

4 per cent. at each of the four surfaces and 1 per cent. in the body of the glass.

In order to render this system of diminishing the intensity of a powerful light by a known quantity suitable for ordinary photometry, the author has designed the following apparatus: A truck is made to slide on the bar, carrying at one end the case containing disc, mirrors, and observing telescope. At the other end, 30 cm. distant from the disc, the truck is provided with another upright, round the head of which revolve, in a direction normal to the bar, three supports bearing a pair of lenses each. The individual lenses are mounted in frames, not tubes, so as to avoid all possibility of reflection; and the frames are attached to the supports by means of pins travelling in slots. Hence the two lenses of each pair can be set at any distance apart, the pair set at any distance from the disc, and any of the three pairs of lenses brought into the path of the high-power rays. A separate support holds a hair at a constant distance of 30 cm. from the disc; and the lenses are adjusted by



causing them to throw a sharp image of the hair upon the photometer disc. The constituent members of each pair are so selected that the pairs diminish the incident light to 1-10th, 1-20th, and 1-40th of its original strength respectively. In making observations, the distance of the light under measurement is the distance from the light to the point which is focussed by the lenses upon the disc—*i.e.*, is 30 cm. less than the distance from light to disc. If the bar is graduated directly in candle power, the scale may be used correctly if the light to be measured is fixed 30 cm. beyond the end of the graduations. When desired, the lens supports can all be swung aside, and the photometer used in the usual direct fashion. The two uprights on the truck are also interchangeable, so that the relative positions of standard and high-power light at the left and right end of the bar may be altered if preferred. If the disc does not travel along the bar, the dioptric disperser must be attached in some suitable fashion to the disc support.

Boiler Explosions.—The report to the Secretary of the Board of Trade upon the working of the Boiler Explosions Acts, 1882 and 1890, with appendices, has been issued, in continuation of previous papers. The report, which covers the year ended June 30, 1905, shows that during the twelve months 14 persons were killed and 40 injured by boiler explosions. In this respect the results, when compared with those for former years, are satisfactory; the average number of persons killed annually during the past 22 years being 28, and of those injured 60. The decline which appears to be taking place in the number of serious explosions may be due to a decrease in the use of steam as a motive power, as well as to the operation of the Factory and Workshop Act, 1901, which render compulsory the periodical inspection of all boilers used in factories and workshops.

Gas-Heated Baths.—The employment of gas for rapidly heating the water for baths has, according to a recent number of the "Gesundheits-Ingenieur," made great progress the last twenty years; but many fatal accidents have arisen owing to improper arrangement of the apparatus. Herr Schäfer has found that in Germany alone 11 deaths have been caused in the past 12 years by faulty construction of heating apparatus, while in 17 cases the accidents did not prove fatal. By reference to diagrams, a number of designs are given to indicate arrangements for fixing the gas-heater out of the bath-room altogether—on the floor above, in a room beneath, or by a very simple modification of the heating apparatus it may be placed on the same level as the bath-room, but in another apartment. It is pointed out that by one or the other of these systems greater security for life, health, and property can be secured at a small additional expenditure.

DEVELOPMENTS IN THE CONSTRUCTION OF SUCTION GAS-PRODUCERS.

For nearly two-and-a-half hours on Friday evening, the members of the Junior Institution of Engineers—assembled at the Westminster Palace Hotel, under the Chairmanship of Mr. Adam Hunter—were considering the question of suction gas producers. Mr. William A. Tookey, than whom no one is more capable of handling this subject, read the paper, which traced the developments in this form of gas-producer; and though he dealt with each portion of the plants in succinct form, and in a general manner, the communication ran over a large number of printed pages. The object of the paper was to show the stage to which design has arrived as the result of experience.

In the first place, it was shown how the suction producer has been evolved from the pressure plant invented by Mr. J. Emerson Dowson, in 1878; and the importance of the discovery made by that gentleman was emphasized. The Benier suction gas plant of 1895 then came in for notice, followed by allusions to Taylor's, Körting's, and Pintsch's plants—these four being the pioneers. Succeeding, came the "Dynamic" producer (1901), Crossley's, Dowson's, and Tangye's. Reference to these types led to comparisons being made of present processes under the heading of the component parts of the complete apparatus.

Referring to the diameter of the fire of generators, the author said this is an important dimension with suction gas-producer plants, and varies with the area and speed of the engine piston, and to some extent with the quality and size of the fuel. The successful working of a suction or pressure plant when supplying gas for an engine working under light loads is dependent upon the fire being maintained at a proper temperature to effect the chemical changes, without which producer gas cannot be generated. It is therefore necessary to restrict the grate area as much as possible, so that the diminution of pressure throughout the apparatus, consequent upon the withdrawal of gas by the engine, shall induce air to enter at such velocity that the fire is quickened and the utmost incandescence obtained throughout the whole bed of fuel even under light loads. There are practical details, however, which decide the minimum diameters allowable. The size of fuel must be considered. Care must be exercised to retain a diameter that will not hinder the fuel in settling down during combustion. Sufficient "blowing" area must be provided for the entry of air in relation to the "dead" area occupied by the fire-bars or hearth. Allowance must be made for the accumulation of ashes which clog up the apertures, and restrict the proper draught. It must be remembered that small areas increase the velocity of entering air, and entail high temperatures, which encourage the fusion of fuel into "clinker" under the heavier loads. Fires small in area demand increased depth of fuel for the proper manufacture of producer gas; and deep fires entail greater variations in internal pressures before the air can be induced to pass through the generator, reacting upon the power developed by the engine. Fires too large in area reduce the initial velocity of the air passing from below the grate, produce slower combustion than with "forced" draught, and allow the incandescence of the fuel to diminish under light loads. If carried to extremes, the heat becomes insufficient to gasify the carbon, and the production of producer gas ceases. Experience has shown that the diameter of the fire at its base—or combustion, zone—is best expressed as a function of the piston area and displacement. The British practice seems to be that a 50-brake horse power gas-engine, having a piston of about 15 inches diameter, a displacement of 2·25 cubic feet, and a mean piston speed of about 600 feet per minute, shall draw from a producer of about 15 inches diameter fuel base.

It has already been pointed out that it is essential for good results that there shall be a sufficient depth of incandescent carbon exposed, in order that dissociation of steam and production of carbon monoxide can be properly and completely effected; but it is unnecessary to provide a huge bulk of fuel, which merely entails resistance to the progress of the ascending gases. A common depth of incandescent fuel is 20 to 24 inches; while in the smaller producers 15 to 18 inches is allowed when anthracite beans or small nuts are used. As a matter of fact, suction producers, after being once charged and thoroughly heated up, will continue to give gas, even when the fire has been allowed to sink to less than 10 or 12 inches thickness; while, in many cases, with engines lightly loaded, a still less depth—about 6 to 8 inches—has been found to yield sufficient gas. In the latter cases, however, it is only when no further fresh fuel is added that such results are possible, as the feeding of a cold charge on a low fire would spoil the gas-making temperature.

After dealing with generator capacities, and quoting from the official report of the judges at the Highland Show trials of suction gas producers, at Glasgow, in 1905,* the author said it should be mentioned that, in order to maintain good gas, it is imperative that the depth of fire should not vary. It is, for this reason, a common practice to arrange a storage bell of ample capacity, within the generator and above the fire, so that a pile of warmed coal always rests upon the incandescent fuel. This black mass of fresh fuel gives off its volatile constituents during the gradual

* See "JOURNAL," Vol. XCI., p. 223.

sinking of the charges into the incandescent zone, and becomes coked before it reaches the gas-yielding portion of the generator. By means of feeding-hoppers, new charges are made from time to time, so that the bell is always filled for several inches above its bottom rim. In the absence of such distilling "bells," the coal falls directly upon incandescent carbon, reducing its temperature, and causing all the volatile constituents of the uncoked fuel to mix with the good gas. The absence of it also permits the tarry vapours to escape from the generator before they can be converted into fixed gases—thus affecting the running of the engine, as well as causing the dirt and dust to be drawn along the connections and to gradually choke up the pipes and the coke in the scrubber.

After leaving the fuel bed, the gases—before being conducted away from the generator and passed to the cooling and washing processes—are allowed to collect in the upper portion of the generator, and to circulate round the distilling bell. In many designs they are made to pass under or through a dish of water before the final exit. Sometimes the outlet is placed at a considerable distance above the fuel bed, to allow a large quantity of coal to be distilled gradually within the generator. As the products yielded during the process expand downwards through the coal, the great heat of the rising gases converts the tarry vapours into fixed gases; and in this way, with efficient washing in the scrubbers, the tar difficulty is reduced to a minimum. Messrs. Pintsch, instead of allowing the gas to circulate round the distilling chamber, provide an annular collecting space about half-way up the generator. This method has much to commend it. The "Dynamic" gas-producer is fitted with a gauze screen around and above the fuel. The screen filters the gas, and holds the solid particles within the generator until converted. This device also protects the plant from risks of explosion through any accidental combustible mixture in the exterior apparatus being fired by the fuel in the generator. When comparing the designs which have as a feature a large cast-iron "distilling" bell above the fire, it is to be observed that, to avoid the drawing up of incandescence through one portion only of the fuel, and especially when light loads only are being served, many manufacturers build the fire-brick lining so that the gas is diverted from a straight path from the fire to the gas-outlet.

Charging-hoppers and their valves, slides, and so forth received considerable notice. Every maker seems to have his own device; and with one or two exceptions, they have double valves permitting recharging during the operation of the plant without much admission of air. The levers are worked by hand. A recent invention, however, is intended to replace hand stoking by an automatic device operated by means of a piston, subjected more or less, by suitable adjustments, to the rise in pressures in the pipe connecting the exhaust chamber with the open air at each exhaust stroke of the engine. The feeding-box is divided into compartments of such dimensions that only a small quantity (about 2 lbs.) of coal is fed into the producer at one time; and it is claimed that, as the engine takes more or less explosions when doing its work, so does the automatic fuel-feed accommodate itself to the corresponding coal consumption. The inventor, Mr. Griffin, of Bath, claims that the device is a great success, that the fire is maintained at a uniform depth under varying load conditions, and that it is possible to work with a clear fire, and thus take advantage of a larger proportion of the sensible heat of the fire and gases for the evaporation of water.

It is considered by many makers somewhat unnecessary to adopt mechanical stoking for the usual sizes of suction plants, which, as a rule, require recharging only with small quantities at intervals of two hours or so. As a matter of fact, the coal consumption, while somewhat proportionate to the load-factor, is not entirely so; and therefore, for the maintenance of a uniform depth of fuel, it is always necessary to make some adjustments by hand to any automatic device according to the load. Otherwise, if set for normal working conditions, the fire gradually sinks under light loads when proportionately more fuel is burnt, or, if set for light work, any continued increase of load upon the engines increases the height of fuel, owing to the greater number of explosions taken by the engine, although the gas at such times is richer in hydrogen, and the required volume is generated from proportionately less coal. The necessity for this adjustment would not occur when fairly steady loads are carried.

The relative advantages and otherwise of wet and dry ash-pits, and of closed and open grates, were next considered; and clinkering and poking facilities also came under notice. Owing to the varying grades of fuel used in gas-producers, means are usually provided for raking out ashes and clinker that may be formed at the base of the fire, and thus ensuring continuity of operation for extended periods. Without these facilities, it is rarely possible to obtain a sufficiency of good gas for longer than ten to twelve hours; while plants permitting poking and clinkering during operation have run, upon occasion, for 700 hours. A door below the fire-bar level enables the accumulation of ashes to be pricked from the spaces between the bars, while two or more doors round the generator, above the bars, permit of the removal of clinker or masses of incombustible slag. In producers having but one poking door, it is very difficult to dislodge the clinker adhering to the generator walls at the back of the fire, and the interior surfaces are usually quickly defaced by the attendant when giving the weekly "clear out." In addition to these doors at the base of the generator, the provision of a poking-hole above the fire, is of great service in consolidating the fuel bed, and breaking down any "arching" caused by overheating or by inferior fuels.

Regarding vaporizers, the designers of separate vaporizing devices point out that, in abstracting heat from the gas between the generator and the scrubber, they are studying the proper action of the apparatus by retaining as much heat as possible within the generator itself, and by reducing the heat as much as possible before the gas enters the scrubber. Thus a saving in both coal and water results. External vaporizers also obviate the tendency to affect the engine's operation after each charge of fresh fuel, as is sometimes very noticeable with vaporizers that are placed round the distilling chamber. Another consideration is that such external boilers are the more sensitive, and respond more readily, to variation of load. Thus as the engine's load increases, and more gas is generated, more steam is made, and *vice versâ*. Usually, also, they are more easily cleaned from deposit, but many types made with heat collection ribs get very quickly sooted up. Suction gas-producers having water vaporizers above the lining of the generator are, however, very much used, and, although less sensitive, they are very effective, providing a copious amount of steam and requiring little or no attention or adjustment. The steam if excessive escapes to the atmosphere, and it is only sucked below the fire when the engine takes gas.

Different designers place the vaporizer round the generators in other positions—round the base of the fire, or round the generator towards the top of the fire. It is claimed that, where the vaporizers are in such positions, there is a great reduction in the amount of clinker formed, and what there is cannot adhere to the cast-iron water vessel, is very soft, and is easily broken up. This is certainly a great advantage; and the linings of generators so fitted last a much longer time, because of the gentler treatment by the attendant with the clinkering iron. A great number of the generator linings inspected by the author have been seriously damaged by the defacement of the internal surfaces due to the adherence of clinker, and the zealous efforts of the man with the poking-tool to dislodge it. But in such producers, it will be recognized that the fire is worked at less heat; and thus any serious diminution in load on the engine is the more quickly felt.

It has been mentioned that vaporizers included in the generator design are less sensitive than those heated only by the hot gases in a vessel entirely separate. With light loads, this is somewhat of a defect, as the amount of steam drawn down with the air to the fire after heavy loads does not appreciably diminish for some considerable time. Consequently, the gas remains of good quality; and the engine takes less explosions in a given period—causing a gradual reduction in the temperature of the fire and irregular running. This point is an important one; and Messrs. Crossley have adopted an ingenious arrangement to overcome the disadvantage, believing as they do that, apart from this, the internal vaporizer is preferable in many ways. Separate vaporizers may be divided into two classes—"bulk" and "drip." In the former a body of water is always present, while in the latter an intermittent flow or a continuous fine stream is used.

A constant supply of water to the vaporizing devices, at a regular pressure, is very desirable; but usually little care is taken to ensure this. An unreliable water service is a source of anxiety to the attendant, as, when working on a fairly uniform load, too much water decreases the amount of steam generated, while a diminished supply increases vaporization—with the risk of overheating, fracture, and burning of parts should the quantity be insufficient to replace the quantity evaporated. In many instances, the author has traced irregularities in working of plants to variations in the water pressure when a branch from a service-pipe to other processes has been utilized; and the use of a small feed-tank and ball-valve, from which the vaporizer and sprinkler can be fed at a constant head, is preferable.

Bulk vaporizers yielding a large amount of steam are not very sensitive to fluctuating demands from a gas-engine. If no regulation of the amount of steam admitted to the fire be attempted, the amount of steam available under light loads is often excessive, as evaporation is still going on under the influence of the heat previously generated; so that, although during "cut out" cycles the excess escapes to atmosphere, yet, whenever the engine sucks a charge, the steam is drawn in through the fuel, yielding a comparatively rich gas. Explosions of rich gas naturally occur less frequently than when poorer gas only is available; and the result is that, should the lighter loads last more than a few minutes, the absence of a current of air through the fire allows the temperature to be reduced, probably to such an extent that the effective degree necessary to dissociate the air and steam is not maintained. Gas-making thereupon ceases, and the engine stops. It is desirable, therefore, when engines subject to extreme fluctuations of load are served, that some means should be provided whereby the steam can be reduced or increased according to the load.

Coolers and scrubbers, water-seals, sprinklers, pressure-regulators, and purifiers were all in turn touched upon; and in the final part of the paper, the subject of starting-fans produced some interesting statements. In order, said the author, to provide means for quick starting, a fan or blower is attached to create a forced draught. The majority of British makers place this fan so that a blast of air is forced through the fire; and it follows that the gases evolved are above atmospheric pressure when the fan is in use. Already some accidents have arisen in consequence. Quite recently an attendant at Seaford was asphyxiated by inhaling gas escaping from a plug in the expansion-box, which he had,

presumably, removed to allow water to drain away. Such accidents are due to the carelessness of the attendants themselves in not recognizing the danger of allowing large quantities of gas to escape in the engine-room when starting up with a pressure-fan; but there is little doubt that such fatalities will cause makers to avoid the risk by adopting exhausting-fans. Here the author incidentally remarked that producer gas is really no more dangerous than gas used in bed-rooms. The danger was produced by the men themselves, or was owing to the erectors of the plant not equipping them with all the little devices that prevent accidents. Suction producers were getting bad names through this; but when they were understood, they were not more dangerous than ordinary gas. One advantage of a pressure-fan is the ability it affords to test for leaks in the apparatus. They are much more easily detected by its means. Exhausting-fans are used by most Continental makers and by two or three British firms.

Discussion.

In the course of the discussion, many details were referred to, which it is unnecessary to touch upon. Among remarks by Mr. L. F. de Peyrecave, he held that it was the gas-producer that had enabled such immense development to be made in the economical working of the gas-engine. He was surprised that Mr. Tookey had not given more hints to users of producers. A few remarks from him on the care necessary by users might be of very valuable assistance in promoting the use of these producers, as well as in saving a great deal of expense by those who did use them, because, in comparatively new plant and machinery, it was as often as not the bad control and management that handicapped the plant more than any inherent imperfection. He proposed a vote of thanks to the author. In seconding, Mr. Hankin was anxious to know whether this producer gas was likely to be used for heating and lighting.

Mr. Hal Williams spoke of the paper as a comprehensive survey of the position of producer plants, but he would have liked a few more details of practical working. In reference to internal and external boilers, he did not agree with the author. The external boiler might be very sensitive to the fluctuations of the load of the engine; but in his experience, especially with the earlier designs, the external boiler was not all-round so satisfactory as the internal. The author had stated that the internal boiler was a great disadvantage, because when the load came off the engine the gas was too rich, the engine took to missing a great number of strokes, and the fire died down. This, of course, was probably the case; but the great thing in connection with a suction plant was its capacity not for dealing with loads which were falling away, but for dealing with loads that suddenly came on. This to his mind was the principal point that had to be overcome. With the internal boiler, they got a great volume of steam admitted. If the load suddenly came on, they wanted a supply of richer gas and a bigger reserve of steam. Therefore a great many makers who previously used external boilers had now gone to internal boilers for this very reason, because their engines might be running at half load and suddenly the load went right up to the top, and the steam, under the former condition of things, was insufficient to meet the demand, the engine could not take it, and the speed fell. With reference to the automatic apparatus which had been described for gradually feeding coal to the fire, this appeared to be very nice if they had not to consider the practical conditions under which these plants had generally to work. Rightly or wrongly, he attached the greatest importance to simplicity and reliability in any plant of this nature; and it was the usual practice of the firm with which he was connected to specify that the generator capacity of any plant should be equal to three hours. When the load fell off, the consumption of coal, of course, went on; but when they specified the three hours—they did it always in plants up to 100-horse power—the attention required by the plant was reduced to a minimum. The automatic feed seemed to him to be a requirement which could well be done without. As to the instance of asphyxiation as quoted by Mr. Tookey, through a man taking a plug out of the expansion-box, they could make these plants fool-proof, but not idiot-proof. If a man removed a plug from a vessel containing poisonous gas, he really did not deserve to live longer; and perhaps it was better he should not. He also referred to the impossibility of keeping up to date with these suction plants, as everybody was improving them. With regard to the instruction of plant operators, he pointed out that they found some makers who could produce these plants, but they were far from knowing how they should be worked. So unreliable were the instructions sent out by the makers, that he had found it necessary to get out a set for the instruction of operators before they started working. As to the use of producer gas for lighting and heating, it was being quite largely used for heating now. By coupling on a small exhauster the other side of the scrubber, and by exhausting out some of the gas—that would be pressure gas, not suction gas—it could be used for heating tailors' irons, and things of that sort; and he believed it was also being employed for lighting. But the cheapest way to get light was to use the gas for turning round a dynamo.

Other contributors to the discussion were Mr. R. H. Parsons and Mr. G. Lygo. The latter gentleman, referring to operators getting bad gas into them, and to Mr. Hal Williams's remark as to not being able to make the plants idiot-proof, said he considered that no plant sent out by a maker had any business to be leaky, or to afford such ease for escapes of poisonous gas. Mr. Arnold Goodwin had hoped to hear from Mr. Tookey something as to the commercial side of this question. Mr. W. R. Beckton was of opinion that new operators should have a week's run under experienced tuition. Mr. H. D. Gould inquired as to the quantity of water used in the vaporizer. He thought that manufacturers, to get out the cost, ought to know something as to such details. Some information was also desired by him as to the largest size of suction producers in use; and he referred to the difficulty there would be in clinkering in the case of a 1000-horse power plant. Mr. Dowson, jun., also spoke; and then Mr. G. H. Hughes related his experience with a 60-horse power plant. There, a certain amount of time was required before the fire and everything was ready. The trouble was in getting steam sufficiently quickly for obtaining a good start. They had to switch on the town gas supply to the engine, and let the exhaust warm up a small coil-boiler to get steam. By this means, they started in a few minutes. The question was put by Mr. A. W. Marshall as to what was the difference in power obtained out of an engine with suction gas and town gas.

A few notes only can be given from Mr. Tookey's full reply. He cleared away some of the points by saying that if he had dealt with all the matters the members had thought he ought to have touched upon, his communication would have been a book, and not a paper. He thought the paper contained several hints for users; but working hints on one plant would not necessarily apply to another. Regarding the point as to the regulation of the steam, he thought that suction plants should be as simple as possible to get the effect out of them. It was not good to go into complicated mechanism, which might give a chance of trouble. He corroborated Mr. Hal Williams's point as to some makers being able to produce plants, but not to work them. With regard to the use of suction gas for light and heating, Mr. Edwards, in a paper read at Birmingham, had stated that he could get good lighting results by using—he (Mr. Tookey) believed it was stated—an albo-carbon burner. But producer gas generated by suction plant could not be used for heating unless a pressure fan was coupled up, and pressure gas obtained. As to Mr. Williams's remarks about internal and external boilers, he was in agreement, as the paper showed; and he was also of opinion that automatic fuel arrangements were not necessary in the small plants. Mr. Gould had called their attention to the water for washing and scrubbing being an item. Where the water supply was found to be deficient, in some country districts oil-engines were being put in. In the case of a small suction plant he was now installing at Sevenoaks, and which was situated at the top of a hill, they were using the water over and over again by filtering. In that case, as the water had to be carted, they would have to economize as much as possible. So far as his information went, the largest producers had been put down by Messrs. Pintsch in Holland. There they had installed six generators of 350-horse power each, supplying six engines of similar power—making a total installation of 1000-horse power. Regarding the question of depreciation, there was really no reason why suction gas-producers should give any trouble; they were often dammed by the way the pipe-connections were made. Renewals were quickly made, and were not costly. Sometimes the vaporizer was burnt out, and sometimes the fire-brick lining had to be replaced. Depending upon the clinkering tool, it would last a year or eighteen months with ordinary care. The hoppers, too, when unprotected by fire-bricks underneath the slide, had been known to burn out. The depreciation, in his opinion, was practically covered by the renewals account. As to Mr. Marshall's inquiry, Mr. Tookey quoted an instance where on one engine using town gas a maximum pressure was shown of 120 lbs. per square inch; and with suction gas, the pressure was 109 lbs. per square inch. It all depended upon the style of the engine and the make. In another engine running in the country, with town gas, a mean effective pressure was obtained of something like 119 to 120 lbs. when working at its best. But do all they could, they could not get more, using suction producer gas, than 70 lbs. per square inch. This was not the fault of the engine or the producer, but simply of the pipe that connected the two. This had now been remedied.

The vote of thanks to Mr. Tookey was then put and passed.

Wethered's "Compound Division Cost-Sheet Ready Reckoner."—We have received a copy of the third edition of this work, which has just been published. It was originally produced, as the result of the expenditure of a great amount of labour by the author—Mr. W. P. Wethered, of Liverpool—in 1883, and was noticed in the "JOURNAL" early the following year. Its object was to facilitate the calculation of any number of articles in pence and three places of decimals of a penny from 1 to 10,000, and pence by tens to 100,000; and judging by the testimonials received, it has proved valuable, not only in saving time but in assuring accuracy, in making out cost-sheets of collieries, gas and water works, and manufactories generally, as well as in the office work of accountants and merchants. Indeed, it was so well appreciated that a second edition was called for three years after the appearance of the first. In a circular accompanying the volume (the net price of which is 17s. 6d. and which can be had at the offices of the "JOURNAL"), the author gives examples of the saving of time that can be effected by its use in making calculations.

SOME THERMIC CONSIDERATIONS OF A RETORT-FURNACE.

By D. D. Barnum, of Worcester (Mass.).

[**A Paper read before the New England Gas Association.**]

A unit weight of coal contains a certain amount of energy which is expressed in heat units, called British thermal units; a B.T.U. being the amount of heat necessary to raise 1 lb. of water 1 degree Fahrenheit. The object of the following test is to determine what becomes of the energy in the coal after it is placed in a retort for carbonization. In doing this work, we also determine the characteristics of this general type of furnace and the conditions that prevail in its working, considered from a thermic standpoint—that is, we determine the efficiency of the retort-bench considered as a heat-machine. The paper has nothing whatever to do with the mechanical working of the bench, the furnace, or the retort-house. The bench contains six retorts, 10 feet long, 16 in. by 26 in. section, with a half-depth furnace of a capacity of 58 cubic feet, and a grate area of 6 square feet. The primary and secondary air are both heated directly from the furnace, and not from the flue gases.

In making the determinations for the test, the following apparatus and methods were used: For gas analysis, the Hempel apparatus; for coke and coal analysis, the ordinary procedure was followed; in determining the various temperatures, Le Chatelier's pyrometer was employed; the apparatus designed and used by Mr. A. G. Glasgow in his test of a Lowe double superheater set was used to determine the radiation and convection; and a Parr calorimeter gave us the heat units in the coke.

In selecting the constants for the specific heats of the gases at various temperatures, I find that different authorities vary; and I have used the figures that have been determined for the temperatures found in this test, wherever possible. The general scheme is that which was followed by M. Euchène in his paper read before the International Gas Congress in Paris in 1900; and for further study of this subject I recommend his paper.*

There are two sources of heat from the coal to be considered in this test: (*a*) Combustion of the coke in the furnace; and (*b*) the heat liberated in the formation of the new compounds when the coal is decomposed in the retort. There are ten items which show the disposal of the heat: (1) Heat carried up the chimney by the flue gases. (2) Heat lost in vaporizing the water and raising the resultant gases (carbon dioxide and water vapour) to the temperature of the flue gases. (3) Heat lost in the ashes. (4) Heat carried off through the stand-pipe by the gas. (5) By the tar. (6) By the water vapour in the coal. (7) Heat lost by radiation and convection. (8) Heat taken out of the bench in the hot coke as it is drawn. (9) Heat absorbed in the formation of the new compounds in the retort. (10) Heat of decomposition of the coal.

The amount of coke used in the furnace per 100 lbs. of coal charged into the retort was 17 lbs. The ashes in the pit contained 26 per cent. of unconsumed carbon, due to the coke falling down while clinkering. The analysis of the coke gave the following percentage results: Moisture, 0·24; volatile matter, 4·19; fixed carbon, 87; and ash, 8·57.

Item A.—In order to figure the net coke consumed, we must take out the coke in the ashes. Of the 17 lbs. of coke, 8·57 per cent., or 1·46 lbs., is ashes. This 1·46 lbs. is 74 per cent. of the total ashes and coke per 100 lbs., or 1·96 lbs.; and 26 per cent. is 0·51 lb., to be subtracted from 17 to get the net coke burned in the furnace per 100 lbs. of coal, or 16·49 lbs. net. A pound of coke gave, by the Parr calorimeter, 13,076 B.T.U.; 16·49 lbs., therefore, give 215,623 B.T.U. placed in the furnace for each 100 lbs. of coal carbonized, and constitutes Item A.

Item B.—In the forming of the new chemical compounds from the coal in the retort, we have either an absorption or a liberation of heat, according to the character of the compound formed. The amount of heat either liberated or absorbed for each compound is known; and by multiplying these constants by the quantity of gas, as given in our analysis, we have the amount of heat absorbed and liberated.

The following is a table giving the analysis of the gas, the amount of each gas per 50 cubic feet of the mixed gases corresponding to 100 lbs. of coal, and the heat formation + or − for each gas, and the total heat + and − for the mixture.

Gas.	Per Cent.	Cubic Feet.	Heat of Formation.	Plus.	Minus.
CO_2	1·1	5·50	463·1	2,548·7	..
H_2S	1·1	5·50	22·6	124·3	..
C_2H_4	8·4	42·00	12 9	..	541·8
O	0·3	..	..	..	..
CO	6 4	32·00	138·4	4,428·8	..
H	50·4	..	..	..	..
CH_4	27·8	139·00	103·1	14,330·9	..
N	4·5	..	..	..	..
		lbs.			
Tar ($C_{10}H_8$)	..	5·00	545·0	..	2725·2
H_2O	..	2·37	6870·0	16,282·8	..
NH_3	..	0·22	1259·0	276·9	..
Totals				37,992·4	3267 0

We have, as a result, 37,992 B.T.U. liberated per 100 lbs. of coal; and this is Item B. There are 3267 B.T.U. absorbed; and that is Item No. 9. Item B is added to Item A, which makes a total of (215,623 + 37,992) 253,615 B.T.U. expended.

Item No. 1.—The temperature of the air before entering the furnace approximated 60° Fahr., and at the outlet of the bench proper it was 1800° Fahr. In determining this later temperature, a number of tests were made, and the average taken. The analysis of the flue gas gave: O, 1 per cent.; CO, *nil.* This determines the CO_2 as 19 per cent., and the N as 80 per cent. The 1 per cent. of oxygen represents 5 per cent. more air than was necessary to burn the coke. A pound of carbon requires 143·5 cubic feet of air for its combustion; 5 per cent. excess of air would, therefore, give 151 cubic feet of air for each pound of carbon consumed. The composition of each 1·51 feet of flue gas will, therefore, be: CO_2, 28·69 cubic feet; O, 1·51 cubic feet; and N, 120·80 cubic feet.

The heat necessary to raise these gases from 60° to 1800° is the specific heat multiplied by the quantity of gas, and multiplied by the rise in temperature, or 1730°. The following is the table giving the amounts of the gases, the amount of heat necessary to raise 1 cubic feet 1730°, and the total for each gas:

Cubic Feet of Gas.	Sp. Heat × Temp.	Total.
28·69 CO_2	62 ..	1788·78
1·51 O	36 ..	54·96
120·80 N	36 ..	4348·80
		6192·54

The total amount of heat necessary to raise the gases corresponding to each pound of carbon burned is, therefore, 6192 B.T.U. The analysis of the coke gave 87 per cent. of fixed carbon; and we therefore have 0·87 × 16·49 = 14·35 lbs. of carbon per 100 lbs. of coal carbonized. For the total heat carried up the chimney by these gases we have 14·35 × 6192 = 88,855 as Item No. 1.

Item No. 2.—The water used to soften the clinker is vaporized at 212° Fahr., and the steam is then carried out through the flues at the temperature of the flue gases. The heat necessary to vaporize the water and then raise it to 1800° is a loss; for though the steam may be dissociated into hydrogen and carbon monoxide and then burned, the heat given off by the burning is exactly balanced by the heat required to dissociate the steam, and the chemical reaction will ultimately give carbon dioxide and water. To calculate this item, we find that 1 lb. of water per pound of fuel is used. A pound of water raised from 60° to 212° takes 1119 B.T.U.; and from 212° to 1800°, 760 B.T.U.—total, 1879 B.T.U.; giving 1879 B.T.U. as the amount of heat necessary to raise 1 lb. of water from 60° to 1800°. We therefore have for 17 lbs. of fuel 17 lbs. of water, or 17 × 1879 B.T.U., or 31,943 B.T.U., as accounted for in this operation.

Item No. 3.—The amount of heat lost by being carried off in the ashes as sensible heat is small—in fact, it can be neglected, as the heat of the ashes dropping into the pan heats the water and helps to vaporize it. This has been accounted for in Item No. 2.

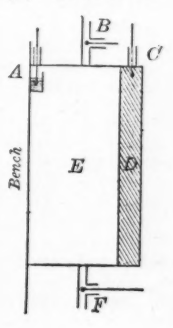
Item No. 4.—The heat carried off by the gas through the mouthpiece and stand-pipe for each 500 cubic feet of gas obtained from 100 lbs. of coal is found by multiplying the amount of each gas (as determined by the analysis) by the specific heat and by the rise in temperature from 60° to the temperature at the outlet of the retort, which I found to be 1200°. This temperature varies from 1000° to 1400°; but a very large proportion comes off at 1200°. Below is a table giving the analysis of gas, the proportion of the 500 cubic feet for each constituent, and the B.T.U. necessary to raise 1 cubic foot of the gas from 60° to 1200°:—

	Per Cent.	Cub. Ft. in 500 Cub. Ft.	B.T.U.	
CO_2	2·2 ..	11·0	× 40·0 =	440·0
$C_n H_m$	8·4 ..	42·0	× 36·0 =	1,512·0
O	0·3 ..	1 5	× 23·6 =	35·4
CO	6·4 ..	32·0	× 23·6 =	755·2
H	50.4 ..	252·0	× 23·6 =	5,947·2
CH_4	27·8 ..	139·0	× 45·2 =	6,282·8
N	4·5 ..	22·5	× 23·6 =	531·0
Total heat carried off by gas				15,503·6

Item No. 5.—The heat carried off by the tar is the weight of tar obtained per 100 lbs. of coal multiplied by the specific heat multiplied by the rise in temperature. The tar amounted to 5·3 lbs. per 100 lbs. of coal. The specific heat is 768 B.T.U. for raising 1 lb. of tar from 60° to 1200°. This specific heat is that determined by Euchène. We therefore have 5·3 × 768 = 4070 B.T.U.

Item No. 6.—Heat carried off by the water in the coal. The analysis of the coal gave 2·37 per cent. of moisture, and we therefore have 2·37 lbs. of water raised from 60° to 1200°. A pound of water raised from 60° to 1200° requires 1586 B.T.U.; and 2·37 × 1586 = 3759 B.T.U.

Item No. 7.—Heat lost by radiation and convection. Radiation is the heat absorbed by surrounding media, and convection is the heat carried off by air currents. In determining this loss, we use an iron box (see diagram), in which E is an air space, and D is filled with water. At A is a thermometer in a mercury cup for taking skin temperature.



* See "Journal," Vol. LXXVI., p. 1141.

F and B are thermometers fitted in the air inlet and outlet, and C is the thermometer that gives the temperature of the water. The skin temperature is determined without the case attached; and then, after placing the case on the surface, a stream of air is forced through E so as to maintain the skin temperature the same. It is evident that if the space were confined, the temperature would immediately rise. The amount of air is measured, and also its rise in temperature. This gives the heat lost on this area of surface by convection. The rise of temperature of the water, knowing the weight of water, gives the loss by radiation; and knowing the surface of the top and front of the bench, we can calculate the total loss. For each 100 lbs. of coal, the loss by convection was 1690 B.T.U., and for radiation 18,971 B.T.U., or a total of 20,661 B.T.U. The bench was one of a stack of eight; and the heat lost at the end of the stack would be divided among the eight benches. This amounted to only 270 B.T.U. per bench, which is added to the 20,661 B.T.U.; making a total loss by radiation and convection of 20,931 B.T.U.

Item No. 8.—Heat carried off by the hot coke. M. Euchène determined that 1 lb. of coke at 1800° carried off 636 B.T.U. Now, 70 per cent. of the coal charged goes to coke, and 17 lbs. of this goes back into the furnace and is not lost. We therefore have 53 lbs. of coke as taken out of the bench, which gives 53 × 636, or 33,708 B.T.U.

Item No. 9.—Heat of formation absorbed. We have seen in Item B that a certain amount of heat was liberated, and also that a certain amount was absorbed; this amounted to 3267 B.T.U. absorbed.

Item No. 10.—We have now the last account to enter. The heat utilized to decompose the coal—that is, the energy necessary to distil off the gas, tar, &c.

We have Items A and B as the heat furnished, and we have Items Nos. 1 to 9 as the heat accounted for. If the sum of Nos. 1 to 9 be subtracted from Items A and B, the difference will give us the gross heat energy used in the carbonizing of the coal, part of which comes direct from the coal in the retort. Item No. 10 thus figured is 51,579 B.T.U. We can now make up our balance-sheet, as follows:—

Expended.	B.T.U.
Heat from coke	215,623
Heat of formation +	37,992
Total	253,615

Accounted for as follows:—

	B.T.U.	Per Cent.	Per Cent.
1.—Carried up chimney as gases	38,855	35·0	47·6
2. ,, ,, water	31,943	12·6	
3.—Lost in ashes	—	nil.	
4.—Carried off by gas	15,503	6·1	9·2
5. ,, ,, tar	4,070	1·6	
6. ,, ,, water	3,759	1·5	
7.—Radiation and convection	20,931	8·3	
8.—Hot coke	33,708	13 3	
9.—Heat of formation	3,267	1·3	
10.—Balance	51,579	20·3	

The net heat of decomposition would be Items 10 − B + 9, or 51,579 − 37,992—13,587 + 3267 = 16,854 B.T.U., or 6·6 per cent. And this is the heat of decomposition, furnished by the coke in the furnace, over and above the heat of formation furnished by the coal in the retort.

In the course of the discussion on the paper, Mr. M'Kay said it was surprising that only 6·6 per cent. of the furnace heat was used in making the gas obtained from the coal; but in the steps by which Mr. Barnum had arrived at this conclusion, the analysis of the flue gas showed 1 per cent. of oxygen and no carbonic oxide. This seemed to him to be good working. He did not understand why the author did not analyze directly for carbonic acid, instead of deducing it from the analyses as made. He thought that it would be interesting to have the formula for computing the excess of air from the percentage of oxygen in the flue gas. Mr. Barnum remarked that determining the carbonic acid in flue gas was a difficult matter in the laboratory, and to do it in flue gases in a retort-bench was even more so. Carbonic acid, of course, was absorbed very rapidly by water. He had found that from 2 to 3 per cent. was absorbed by the water of condensation. If they determined the oxygen and the carbonic oxide, and there were no illuminants, the carbonic acid could be calculated from the amount of oxygen, which in this case would bring it up to 19 per cent. If there was 1 per cent. of oxygen, its proportion to nitrogen would be 1·4; and this 1 per cent. of oxygen corresponded to 5 per cent. of air entering the furnace. Mr. M'Kay asked if he was to understand that the habitual working of the author's furnaces was satisfactorily accomplished with only 5 per cent. excess of air. Mr. Barnum said this was the best combination to run. It was better and more economical to have an excess of air than to work on deficient air. The amount of heat lost by not burning the carbonic oxide completely was greater if they had 1 per cent. too little oxygen, or 5 per cent. of air, than the amount of heat lost by heating this extra 5 per cent. of air up to the temperature of the flue gases. Mr. A. C. Pease said he had been working his benches for six months without any chemical tests of the flue gases—merely observing whether or not there was a blue flame in the waste-gas flue. At the end of the time, however, they tested with the Orsat apparatus, and found between 1 and 2 per cent. of oxygen and no carbonic oxide. They thought this was running pretty close, without making analyses of the flue gases. Mr. H. A. Carpenter said the point that impressed him most in the paper was the 12·6 per cent. of heat carried away by the water, and the possibility of saving it. Mr. Barnum's operation of his producer was very nearly normal. He might have been gasifying a rather high rate of fuel per square foot of grate area; but he believed the usual practice in operating such producers, and avoiding clinkering by water or steam, possibly required the use of more water, if anything, than Mr. Barnum had employed. He had probably used nearly all that he could evaporate from the water-pan without putting live steam under his grate-bars. The Germans built their benches with a boiler in each setting; so that they could get plenty of steam, and keep the clinker down. The author's figure of 12·6 per cent. of heat carried off by the water vapour going up the stack was therefore normal. This would amount to, roughly, 2½ lbs. out of the 17 lbs. of total coke used. This was a big saving. There was another item which went along with it, and this was the 26 per cent. of carbon in the ash. If clinkering could be practically dispensed with, they would get this half-pound, which in the author's particular case at Worcester, with the bench as he was running it, would amount to 3 lbs. out of the 17 lbs. Mr. M'Kay said that another matter which was very clearly brought out in the way the figures were arranged was the benefit of feeding the coke hot into the furnace, rather than placing it in after it had been quenched. Mr. Barnum had, in Item No. 8, 17 lbs. of the 70 per cent. of coal going back into the furnace, and a total of 53 lbs. taken out of the bench—33,000 heat units accounted for in the hot coke. Now, 17 lbs. was equal to about 11,000 heat units; and it was worth this to the manager if the coke was fed into the furnace direct rather than first being quenched, as was required in some constructions where the furnace was not adjacent to the retort mouthpiece.

The general opinion of the members was that Mr. Barnum had done the Association good service by submitting his paper; and they accorded him a hearty vote of thanks for it.

ARCHITECTS AND ARTIFICIAL ILLUMINATION.

At a recent Meeting of the Illuminating Engineering Society lately formed in New York, the following paper, on "Artificial Illumination from the Architect's Standpoint," was read by Mr. Waldo S. Kellog. He explained that his intention was to touch upon a few of the general features of interior illumination, while attempting to outline the architect's interest and his relation to others who are concerned with the same subject, though they regard it from a different point of view.

The high intrinsic brilliancy of most lights is largely, I think, responsible for an immense quantity of the light usually wasted. In figuring on a high efficiency, the maker forgets that the dazzling effect of an unshaded light so blinds the eye that a much higher degree of illumination is required. In thus getting, for advertising purposes, a slightly higher theoretical efficiency, practical considerations are lost sight of. If the makers of lamps considered only the best interests of the consumer, rather than the seller of current or gas, well-shaded lamps would be the rule, and not a special article supplied reluctantly at a price calculated to discourage their use.

The so-called 16-candle lamp has become the generally accepted one; but recently the tendency seems to be towards more powerful lamps, not because there is a demand for them, but by reason of improvements in efficiency. It was remarked above that manufacturers catered for distributors of light; hence, to induce them to take up their lamps, new units are made up using the former amount of gas or current, and a great noise is made about the intensity of illumination. If the public can get an innings, it may pay to advertise: "We can give you the same light for half the money;" instead of as now, "For the same money we can double your illumination."

There is no generally accepted standard lamp rating except such as best suits the eccentric distribution of the lamp for which at that moment some manufacturer is claiming the merits of all other lamps, besides other virtues. The candle is a reasonably satisfactory unit of measure; but the rating of lamps in candle power should mean something, and enable one to judge what the illuminating value really is. Spherical candle power rating is a fair basis of comparison; but the reflector lamps now being introduced, and the devices for turning all the lights into the lower hemisphere, seem to make the present prospects poor for the adoption of a logical spherical rating.

Until this rating is adopted, no one, unless he is able privately to ascertain the true rating, is prepared to say that a certain intensity of illumination can be obtained by using a given number of lamps of one kind or a different number of another kind. If without means to get data, he must, to protect himself, put outlets for two and (to be really safe) three times the number of lamps the manufacturer's rating in candle power calls for; and the client is apt to complain of large lighting bills. It is in this necessity for protecting himself that the architect lays the foundation for the unpopularity of the light distributor.

In all cases a lamp should be so constructed as to harmonize

with its architectural surroundings. The lamp, in a carefully designed building, must conform to the architectural background with as small a sacrifice of efficiency as possible. Thus, when a manufacturer professes to be unable to adopt a standard design to suit the architect's ideas, he must expect to be told that if this is the case the lamp will not be used, as considerations of efficiency are of less importance than the æsthetic ones.

The colour of any light plays a more important part than some manufacturers like to believe. Man has become so accustomed to the warm glow of candles or similar light that in domestic work he prefers a light of this colour; and a bluish-white or greenish-white light will be used only when very strong illumination is needed. Women say that candlelight adds to their natural attractiveness; and with them in opposition, the sickly light is very heavily handicapped.

The architect is employed to make a structure both convenient and beautiful; and in doing this it is often necessary to sacrifice so-called practical considerations for others of an æsthetic nature, naturally to be regarded as of great importance in the practice of a fine art.

REMOVAL OF NAPHTHALENE.

At the recent Meeting of the New England Association of Gas Engineers, Mr. A. K. QUINN, of Newport (R.I.), made the following remarks on the above subject.

Last October, after twenty years of fighting naphthalene, I tried oil. Previously I had had naphthalene simply at the inlet and outlet of the holder. My governor had to be washed out twice a day, either with naphtha or hot water; and the outlet drip of the holder had to be pumped out twice a week. The quantity of condensation taken out of the outlet drip was about 60 gallons of water a week. I have no doubt now that the pipe in the holder was almost closed with naphthalene, for the reason that during the time of heaviest output the governor-valve would be wide open. I had to weight down the holder with 7 tons of iron on top of it, to get 3·6 inches pressure; and still it would not supply the gas. The valve was down 4 inches, wide open, and yet the pressure at the inlet of the governor would be reduced 0·7 inch; the pressure of the holder being 3·6 inches, and the pressure at the inlet of the governor 2·8 inches.

This was the first time in twenty years that I had had a public complaint at Newport about the quality of gas due to the pressure. I tried everything. I fortunately had on hand some oil that would not thicken at zero; and I put 250 gallons inside the holder, on top of the water. That night I had no trouble with the governor. The next morning I had still no trouble with it, and I opened it to see what the condition was. There was not a trace of naphthalene there; and I have not seen any since. The action of the governor showed that the outlet-pipe of the holder had been filled with naphthalene. From the inlet-pipe I got just the amount of water that was absorbed by the gas in passing through the meter. I pumped this out of the drip twice a week. I used thousands of gallons of naphtha to dissolve the naphthalene in the pipes. Then I drew the meter water-level down, and put about 75 gallons of oil in the meter, with the same result as at the inlet of the holder—no naphthalene.

With small works one can do anything—bye-pass the coal gas to the water-gas holder, shut off the meter, and do anything we wish. I opened the inlet-pipe to the holder, and took out about 4 bushels of naphthalene. After running the meter with oil in it for about two months, the oil was used up and the water in the meter was taken up by the gas again; and we were getting a small quantity of water and naphthalene in the inlet-pipe and drip. A few days ago I drew off the water again, and put in more heavy oil. I thought at the beginning that any oil would do. I put in Texas oil, such as is used for water gas; but I found that it emulsified or broke up in small globules much easier than the heavier oil, called ammonia oil. Since putting in this oil, condensation has ceased at the inlet-pipe. Since oil was first used (Oct. 8, 1905), we have not pumped 2 gallons of water out of the outlet drip, neither have we had any naphthalene trouble whatever in the district.

On Oct. 3, at 3 p.m., the temperature of the gas under the skin of the holder on top was 80° Fahr.; and that of the gas going in from the meter to the holder, 65°. The temperature of the air was 62°; showing, of course, that the temperature of the gas had been increased by the action of the sun upon the holder from the 65° at which it went in up to 80°. The gas at 65° went through the inlet-pipe placed in water which was at a temperature of 44°. On Oct. 9, at 12 o'clock, I found the temperature under the crown of the holder was 110°. The temperature of the gas at the meter was 65°, and that of the air 67°; while that of the gas after leaving the purifier, which was about 150 feet from the meter, was 68°, or about 3° higher. On Oct. 10, at 10 a.m., the temperature under the crown of the holder was 90°; at the meter, 65°; of the air, 64°; and of the gas after passing through the purifiers, 66°. On Nov. 10, at 10 a.m., the temperature at the top of the holder was only 70°; of the gas, 62°, both at the outlet of the purifier and the inlet of the meter; of the air, 56°.

Somebody suggested to me that oxide would not purify unless it was moist. By putting a series of sprays on top of the boxes, I moistened the oxide three or four times a week by putting in a certain number of gallons of water. I got all the naphthalene I wanted after that; so I stopped it. I filled up everything at the works with naphthalene; but after I put the oil on top of the holder and in the meter, and used all the naphtha up, I did not see a trace. Ammonia oil can be bought everywhere. Of course, I used a low-grade oil. But what the price was did not make any difference. If it was $10 a gallon, I would use it; but I do not think it cost more than 15 c. or 20 c. a gallon.

Mr. Quinn's relation of his experience evoked some interesting remarks. The first speaker was Mr. J. A. Norcross, who referred to an incident which occurred at Beckton. It was found that one of the large holders did not land properly. Whenever the lower lift reached the bottom of the tank, it would tilt. This became so serious that they were afraid of the holder eventually wrecking itself. It was landed and the water drawn down, when it was found that there was a heavy layer of oil on the surface. Eventually, on emptying the tank, a very large deposit of naphthalene was found at the bottom. It had deposited irregularly, some of the lumps being from 12 to 15 inches thick. This was the explanation of the trouble with the holder. They did not know why the deposit had taken place; it had never been noticed in any of the other holders, and had not been heard of in other places. Some experiments were made in the chemical laboratory, and they proved clearly that the oil on the top of the water in the holder had continuously absorbed naphthalene until it was saturated. This did not matter in the summer time; but as the oil and the water cooled down with cold weather, the naphthalene in excess of saturation crystallized out, and was deposited in the bottom of the holder. The oil had accumulated for some years, either alternately with coal gas and water gas or with a mixture. The use of the water gas had introduced a deposit of oil which had formerly not existed on the water of the holders.

Mr. W. H. Gardiner inquired as to the effect on the illuminating power of the gas of the oil floating on the water in the holder. He said he was under the impression that various forms of heavy oil were used in scrubbers to extract the benzol from gases which it was desired to free from illuminating qualities. Bringing oils into continuous contact with the gas for the purpose of extracting the naphthalene, might have a very deleterious effect on its illuminating value. It might be that the qualities of oil used for the purpose of extracting naphthalene were such as to give up to the gases certain countervailing lighting values; and hence the increase in the candle power stated. But this was a great surprise to him. He said the reason he asked the question primarily was that it had occurred to him that if the illuminating value were not affected, it might be that oil scrubbers of very constricted form could be used more efficiently for scrubbing out the naphthalene (say) at the inlet and outlet of the holders, and various other points in the works where trouble arises. He thought small scrubbers, placed locally wherever desired, could be used, and the gas passed through them. This would obviate the difficulty which was spoken of as having occurred with the Gaslight and Coke Company at their Beckton works.

Mr. W. G. Africa remarked that in the Philadelphia Gas-Works they had scrubbers similar to those described by Mr. Gardiner. They used with very good success water-gas tar for scrubbing, to take out the naphthalene. After testing the gas and finding out that it had a surplus of naphthalene, they ran it through these scrubbers. Mr. W. K. Morrison pointed out that the two kinds of oil which had been mentioned were different. The London one was a drip oil from the water gas, deposited on the top of the water in the tank; and he believed this was the oil used by the Philadelphia people in their scrubbers. The oil employed by Mr. Quinn was a heavy lubricating oil; and he evidently employed it simply as a mechanical means of separating the gas and the water. He (Mr. Morrison) could not see how the oil could absorb naphthalene. Its only object, it seemed to him, was to prevent the gas from coming in contact with the water, absorbing the moisture, and preventing it, when it condensed, carrying the naphthalene down with it. The President (Mr. F. S. Richardson) said if any mechanical means were employed to keep the water and the gas from coming in contact with each other, the effect would be about the same—the naphthalene would be eliminated. Therefore it was safe to say that the author's simple method could be used without any danger of the conditions obtaining in the bottom of his tank that were so disastrous in the case of the London Company.

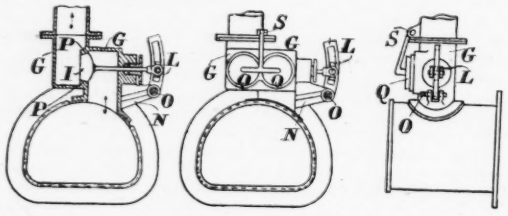
In replying to the remarks of the different speakers, Mr. Quinn said, instead of oil having a deleterious effect on the illuminating power of the gas, it helped to increase it 1 or 1·5 candles on 17-candle gas. On the bar photometer, he found an increase of about 1 to 1·25 candles, the conditions being exactly the same, using the same grade of oil. Before he used the oil, he was in great difficulty. He could not really get illuminating power enough. He used cannel coal in the coal-gas plant, and increased the quantity of gas oil to raise the illuminating qualities of the water gas; but the result was always the same. Naphthalene cost his Company a good many thousand dollars. It necessitated a new governor, a new station meter, and many enlarged service-pipes. The meter became plugged up with naphthalene, and so did the governor. He blamed the makers; but he found it was his own fault. The oil had removed all these difficulties.

REGISTER OF PATENTS.

Valves for Use with Dry Mains in Gas Manufacture.—Helps, G., of Nuneaton. No. 7519; April 10, 1905.

This invention relates to the sealing of ascension pipes by "specially combined valves easily opened or closed and having means of ready access." Hitherto, where dry mains are used, the patentee points out that a wing valve has been arranged on the bridge-pipe or seal pipe, actuated by rods and chains carried down to such a level as will allow them to be worked from the retort-house floor. Dry mains have also been used without any valves; the governor being so arranged as to give (in theory) a level gauge, "but which in practice is not satisfactory."

The present invention refers to sealing ascension pipes at or near the retort mouthpiece, so that all, or nearly all, the solid deposits formed in the ascension pipes and mains are dropped into special connections and can be readily removed.

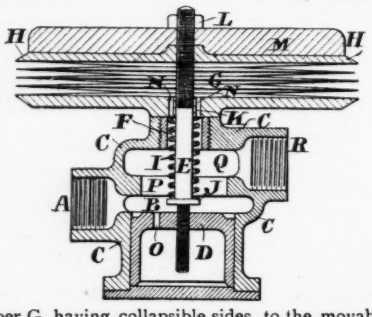


On the retort mouthpiece shown, a specially-constructed valve-box G is arranged, having connection with the ascension pipe on one side of the valve I, and with the retort on the other side. To actuate the valve disc from the outside, it is connected to a spindle passing through a stuffing-box attached at its other extremity to a sliding block L, moving in a radial slotted arm secured to the jaws of a bracket N in such a manner that a box-key spanner or fixed lever applied at O withdraws the disc from, or forces it on to, the valve-seat P. The cleaning-door G, to give access to both sides, is hinged, as shown at S, or is attached in any suitable manner, and when necessary some form of cross-bar and screw may be used to keep it in position.

Gas-Pressure Regulators.—Cook, E. S., of South Lambeth Road, S.W., and Chipperfield, W. H., of Myddelton Square, E.C. No. 10,360; May 17, 1905.

This apparatus for automatically governing, regulating, or equalizing the pressure of gas in pipes to a varying consumption consists of an elastic box or chamber, for opening and closing, by means of a piston, the inlet port, and operated by the pressure of the gas and against the resistance of a spring surrounding the piston-rod, which passes centrally through the elastic box and valve-chamber and is regulated by a nut on the outer end.

The gas enters the apparatus—at the normal pressure from the main, or at an increased pressure from compressors—at A, through the annular port or valve B, in the cylinder C, within which cylinder a piston D moves longitudinally. The piston-rod E passes through the end F of the cylinder, which is secured to, and opens into, the elastic



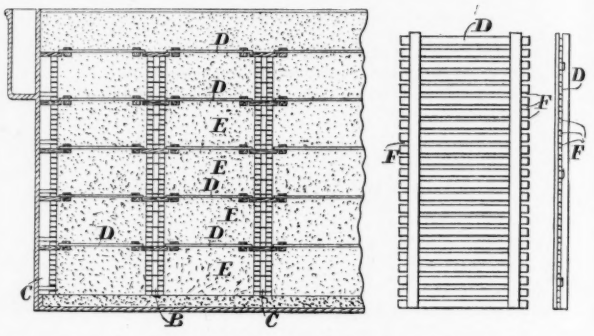
box or chamber G, having collapsible sides, to the movable end H of which it is secured. I is a spring surrounding the piston-rod, the lower end bearing against the flange or collar J, and the upper against the end K of the chamber G; the nut L enabling the resistance of the spring to be secured in position (when regulated as desired) by turning the piston-rod.

When the apparatus is in use with the box G uppermost of, and in a vertical line with, the cylinder, the necessary pressure may be obtained by a weight M, on the upper end of the chamber, with or without the aid of the spring I. N are a series of ports or openings arranged in the end K of the elastic box annularly of the piston rod, to permit of the passage of gas to and from them. O is a similar port for the passage of gas to the underface of the p ston D. Gas entering the cylinder C, passes through the annular port B and opening P, enters the chamber Q, passing thence through the screwed nozzle R to the point of exit. When the gas reaches the point at which it overcomes the resistance of the spring I, or weight M as the case may be, the chamber G will expand, thereby raising the rod E, and with it the piston D—thus decreasing the area of the supply port B. The passage of gas at the point of exit has a contrary effect, and thereby maintains a constant pressure, notwithstanding variations in the amount of gas consumption.

Grids for Gas-Purifiers.—Morris, F. H. G., of Old Brentford, W. No. 10,971; May 25, 1905.

This invention relates to purifiers in which the gas passes horizontally through the purifying material; and it consists in "supporting the purifying material on trays, grids, or hurdles." Ordinarily, the patentee remarks, where the gas passes horizontally through the material from the inlet to the outlet conduits, the material is supported upon a "net-like grating of grid bars interposed between the conduits." But in some instances and with some descriptions of purifying material, he says he finds it possible to dispense with this "net-like grating of grid bars" and to carry the purifying material upon a series of trays, grids, or hurdles extended horizontally between the conduits at "convenient vertical intervals—such intervals varying according to the character and density of the purifying material used."

In carrying out the invention, the purifier casing is filled up with the loose purifying material to the level of the first grid; a layer of grids is then put in place, and the purifying material is filled in to the level of the second grid; a second layer of grids is then put in place; and so on, until the casing is full.



A sectional elevation is given of part of a purifier constructed according to this invention, and a plan and side elevation of the grid. B is the inlet-conduit; C, the outlet-conduits; and D, the grids, trays, or hurdles supporting the purifying material E. These trays, grids, or hurdles are made of either wood or metal, formed of slats, battens, or bars, with or without the intervening spaces F, or of boards or plates, which may be either plain or perforated. In some cases, the bars are made of triangular, square, or rectangular section, "to permit them to be walked upon without damage when the purifier is being filled and discharged;" and they may be placed either transversely as shown, longitudinally, or anglewise.

Lock for the Money Drawers of Coin-Feed Gas-Meters.—Hammond, W. H., and Bishop, E. W., of Eastbourne. No. 13,888; July 5, 1905.

The inventors propose to construct a lock for use in the same manner as a padlock, and especially applicable for the money drawers of coin-feed gas-meters, but such that the bolt itself forms the means of connection with the staples—the usual bow being dispensed with. The bolt is automatically released and locked when the lock engages the staple; means being also provided for retaining a strip of paper or seal for indicating if the lock has been tampered with.

In action, the paper is placed in position (the bolt in the unlocked position), and the cover applied. The lock as a whole is then pressed on to the staple or two staples. This action will depress the spring-controlled catch plate and allow the bolt to be shot home, and secure the lock to the staples, the cover being also secured thereby to the lock casing—the seal being viewed from the front of the cover.

Coin-Freed Gas-Meters.—Hutchinson, C. H. & B. G., of Barnsley. No. 14,456; July 13, 1905.

This "improved coin-freed apparatus for gas-meters" is characterized by a coin-receiver (provided with guide-pieces) adapted to be reciprocated through a half-revolution and to turn a screwed spindle when connected therewith by a coin; the spindle bearing a threaded wheel meshed with a long pinion, which latter meshes with a crown-wheel supporting a removable spur wheel, while the said spur wheel engages with a worm driven by the ordinary meter train.

In the arrangement shown (p. 243), a measuring-out screw C (fixed between brackets) has its enlarged end provided with a slot projecting through the bracket. The coin-receiver D is formed of two flanges connected by longitudinal bars, one of which has a slot of smaller size than the diameter of the required coin. Through a hole in one flange projects the enlarged end of the measuring-out screw, and the other flange is attached to a handle F, by means of which the coin-receiver may always be reciprocated through a half-revolution—this movement being limited by a pin and projections.

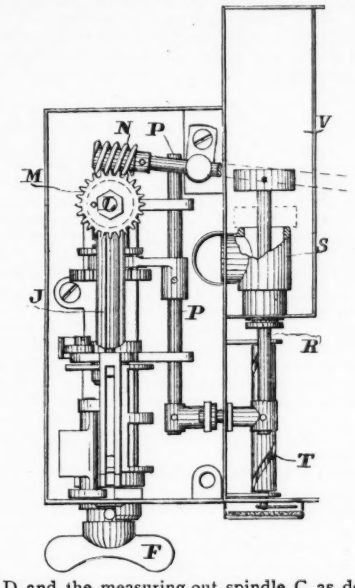
If a coin of the required value E be inserted through the coin-slot G, it will pass through the coin-guide into the receiver D and rest in the slot of the bar (as shown dotted), and, by engaging with the slotted end of the measuring-out spindle, the latter becomes mechanically coupled to the coin-receiver. Then, upon the handle being turned, both D and C will be turned with it until a half-revolution has been completed, when the coin drops through an opening in the frame. A guide is provided to prevent the coin falling before the half-revolution is completed; but this is not shown.

In order to ensure the turning of the measuring-out spindle through exactly half-a-revolution, a disc H, provided with diametrically disposed notches, is secured to the spindle C, and a pawl, under the influence of a spring, is arranged to engage with each of the notches in turn. This arrangement "effectually corrects any irregularity in the amount of rotation due to differences in the thickness of the coin."

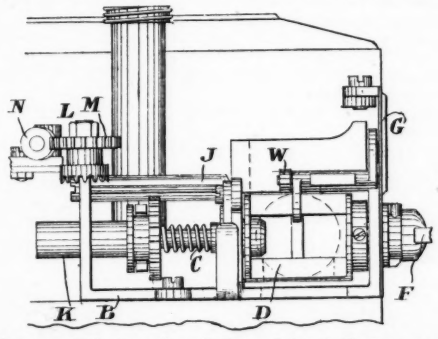
Upon the measuring-out spindle is provided a threaded sleeve K, upon which is fixed a wheel, between which and a flange a recess is formed; and a long pinion J is pivoted between the brackets and meshes with the wheel. Upon a spindle L, which forms the upper portion of one of the brackets referred to, is placed a crown-wheel, which meshes with the long pinion. A removable price-changing

worm-wheel M is connected to the crown-wheel and held in position by a nut. A worm N, secured upon the end of a spindle, engages with the wheel M; the spindle, being supported in a pillar forming part of a bracket, is secured by a screw and nut to a fixed plate. The hole in the plate through which the screw passes is oblong—thus enabling the position of the bracket to be adjusted. The inner extremity of the spindle is connected in any convenient manner with the driving spindle of the ordinary meter train.

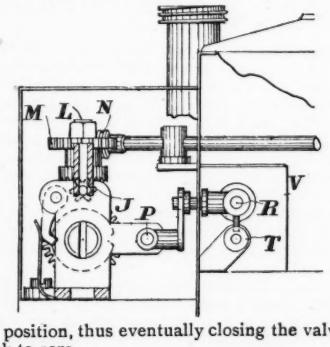
Upon a coin of the required value being inserted, it connects the



coin-receiver D and the measuring-out spindle C as described; and upon the handle F being turned, the spindle is turned with it; but as the wheel is held by the pinion J, the sleeve K is unable to turn, and, owing to its being screwed upon the spindle, the sleeve is forced outwards. This movement of the sleeve carries with it the forked piece and the rod P to which it is attached; and as the valve rod R is coupled to the rod P, the valve disc is moved away from its seating—thus allowing the gas to pass into the meter. At the same time the



long-pitch screw T is turned, and the pointer indicates upon a scale the amount prepaid. Successive coins operate the mechanism in a like manner, and the valve disc is moved a corresponding distance away from the seating and the pointer turned further over the scale. As the gas is consumed, the motion of the ordinary meter mechanism turns the rod and worm N, thus turning the wheel M, the crown-wheel, the long pinion J, and the wheel of the sleeve K, and screws the sleeve upon the threaded spindle C. This causes the sleeve to move back



into its normal position, thus eventually closing the valve and bringing the pointer back to zero.

In order to vary the amount of gas supplied per coin, it is only necessary to vary the number of teeth in the wheel M; and the variations in the diameter of this wheel require the position of the worm N to be adjusted, which is readily effected.

If a coin of smaller size than that required be inserted, it will drop through the slot in the bar of the coin-receiver D, and pass into the till below without operating the apparatus.

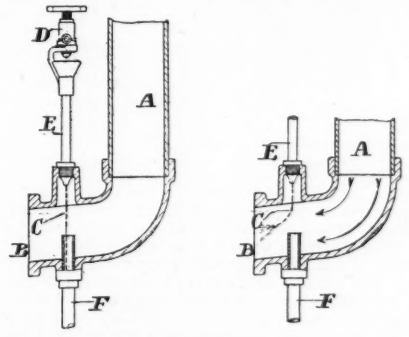
In order to prevent the insertion of a second coin into the coin-receiver before the first one has completed its operation, there is a slot-closing device, pivoted at W, provided with two fingers and a weighted portion, which latter tends to hold the slot-closer in its normal position. In this position, the extremity of one of the fingers rests against the bar of the coin-receiver D. When a coin is inserted, it pushes away the finger and consequently moves the other finger in the path of the coin-passage, thus preventing the insertion of a second coin. The rotation of the handle F turns the slot-closing device still farther, in which position it is retained by a rib of the coin-receiver. After the coin has been released from the coin-receiver and the handle is returned to its normal position, the slot-closing device is brought into position by its weighted projection. If the handle be turned without the previous insertion of a coin, the slot-closing device will be similarly operated, which prevents the introduction of a coin unless the handle is in its normal position.

Suction Gas-Producers.—Fielding, J., of Gloucester. No. 14,498; July 14, 1905.

This invention relates to the automatic regulation of the supply of water for furnishing the steam which it is found advantageous to introduce into suction gas-producers when working in conjunction with internal combustion engines. When the engine is running to its full capacity, a maximum amount of water may be used in the producer; but at light or no load it is found preferable to diminish or cut off the supply of water altogether.

In order to effect this regulation automatically, the patentee proposes to cause the water to drop from a nozzle into a branch pipe provided with three branches—No. 1 being for the admission of air; No. 2 for carrying away the surplus water; while No. 3 is a branch leading to the producer. A dividing fin or ridge is formed in the branch piece between Nos. 2 and 3, beneath and slightly to one side of the falling stream or jet of water, in the direction of branch No. 3. Under the conditions of light or no load, the stream of water falls into branch No. 2, and runs away to a waste pipe, which may conveniently terminate in a water seal.

At a slightly higher level than the top of the dividing fin, and on the same side as branch No. 2, is the opening for the admission of air, which is drawn in by the suction action of the engine. This air enters horizontally, and impinges upon the side of the stream of water, which is thereby caused to fall on the side of the dividing fin towards branch No. 3. Thus at each stroke of the engine when gas is drawn from the producer, there is a rush of air through the air inlet of the branch piece which carries with it the water into branch No. 3; the air and water being drawn together into the producer—it being understood that the latter is fitted with a suitable device for converting the water into steam, the steam and air together entering the fire in the producer.



One form is shown in which the apparatus may be conveniently constructed and applied. A is the air-inlet; B, the outlet for air and water leading to the generator; C, the water-jet in connection with which is the regulating valve D and water pipe E. F is the surplus water outlet-pipe arranged slightly eccentric to the water-jet, so that when the water drops vertically it may just escape, as shown in the first sketch. When, however, by the action of the current of air entering the generator the jet is deflected laterally, as in the other sketch, the water will be carried along with the air into the generator, where it is converted into steam before entering the fire-chamber.

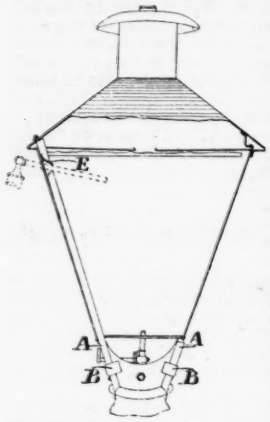
Couplings for Plain-End Pipes.—Dresser, S. R., of Bradford, Penn., U.S.A. No. 14,696; July 17, 1905.

This invention relates to improvements in the pipe-couplings described in patents No. 4552 of 1900, No. 1997 of 1900, and No. 18,352 of 1899; the object being to provide a coupling for uniting the plain or unthreaded ends of plain-end pipe, and at the same time permit the movement longitudinally of the pipes caused by contraction and expansion "without affecting the tightness and effectiveness of the coupling." The coupling referred to consists of a sleeve which extends over the meeting ends of the pipes, and is provided interiorly with lugs to engage the ends of the pipes, and at its ends with portions bevelled from the inside outwardly. Rubber packing rings are arranged to fit recesses in the clamping rings employed, having an annular bevelled portion to fit between the bevelled portion of the sleeve and the pipe. There are the usual bolts for drawing the clamping rings together and forcing the rubber packing rings against the ends of the sleeve.

Street-Lanterns.—Mowat, J., of Helensburgh, and Mackinnon, J., of Glasgow. No. 16,197; Aug. 9, 1905.

In lieu of supporting the lantern on the usual "crinoline" or ornate open frame, through which and the bottom of the lantern access is usually obtained for lighting the burner, the patentees propose to form the lantern integral with the crinoline, which is made in the form of a

socket piece—preferably a casting, whose base is adapted to fit on, and be secured to, the upper end of the lamp-post. The upper side, which is of tapering basket form, has formed at its four corners bands B, to serve as sockets for the reception of the lower ends of astragal bars A constituting the lantern frame; the bars being preferably rolled angle bars of iron or steel whose upper ends are united to the cover of the lamp body. The corner bars are secured to the crinoline by running in molten metal in the corner sockets. The crinoline is fixed to the lamp-pillar by pinching screws.

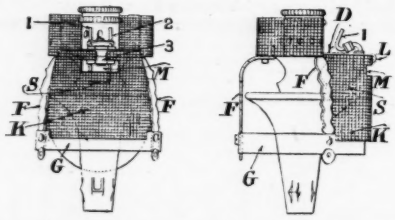


One side may be a hinged door in which is fitted a small inwardly opening flap E covering an opening through which the torch may be inserted for lighting the burner. The roof of the lantern, which is of the usual ventilator type, may be fitted with reflecting plates, or, as is preferred, a horizontal reflecting plate, having a central orifice for the passage of the products of combustion, is formed with an inturned flange around its edges, by means of which it is secured to spring brackets or straps depending inside the pyramidal cover. "There being a free space within the cover above the reflecting plate, and the usual funnel being absent, risk of blow-down of wind upon the incandescent mantle is avoided."

Electrically Lighting Inverted Gas-Burners.—Bénard, P., of Epernay, France. No. 24,200; Nov. 23, 1905. Date claimed under International Convention, Nov. 26, 1904.

This invention relates to lighting devices of the kind wherein ignition is effected by a platinum coil made red-hot by the passage of an electric current; and the improvement consists in arranging the platinum coil, which serves to light the gas, outside of, and in a position to be shielded from, the flame in such wise that when the burner is opened the gas is concentrated in the chamber containing the coil, which thus ensures lighting under normal conditions.

The inverted burner shown comprises a bunsen disposed on top, an inverted porcelain cone B in the centre, and the gas-outlet passages at the foot. A metallic plate D, having a central orifice, is fixed between



the bunsen and the body of the burner; and to the plate are attached the arms F, which support, near the lower part, a gallery concentric with the burner. The platinum coil S is placed between two branches 1 and 2 of the coil-carrier 3; and this is fastened to the plate D by means of claws H and I cut out in the plate and forming brackets.

A cover of wire cloth or gauze K is placed around the burner at the side of the coil, as shown in the drawing. It is arranged vertically, and is secured on top to the plate D, to which it is fastened by means of a tongue L on the plate, which engages the orifice M in the cover. At the lower part, the cover extends down as far as the gallery G, on which it rests, and is kept in position laterally by the arms F. A sort of chamber is thus formed, limited by the plate D and the cover K; and in this chamber is suspended the coil S.

When opening the gas-cock, nearly all the gas which escapes through the burner concentrates in the chamber where the platinum coil is disposed; and if the electric current is sent at this moment through the coil, the coil being made red-hot in the body of the gas, ignition will be assured. On the other hand, as soon as ignition is effected, the coil S, placed near the top of the device and behind the protecting cap constituted by the cone B, will not in any way be subjected to the flame or to the heat of the burner, so that it will not rapidly deteriorate.

APPLICATIONS FOR LETTERS PATENT.

8486.—Gore, J., "Enriching and compressing gas." April 9.

8544.—Wouwermans, P. von, and Loewenstein, L., "High-pressure and other bunsen burners." April 9.

8547.—Smith, J., "Lighting and extinguishing gas by variation of pressure." April 9.

8591.—Lynde, F. C., "Burners." April 10.

8632.—Talbot, F., "Water-meters." April 10.

8666.—Colbran, J. B., "Incandescent burners." April 10.

8670.—Bauke, F., "Production of gas." April 10.

8705.—Lynde, F. C., "Producing gas from petrol." April 11.

8752.—Taylor, H., Russell, T. T., and Haight, T. S., "Mantles." April 11.

8769.—Welch, W. H. I., "Inverted burners." April 11.

8778.—Bauke, F., "Suction gas-generators." April 11.

8792.—Lentschat, G., and Drahonowsky, W. J., "Gas-igniter." April 11.

8849.—Kent, W. G., "Liquid meters." April 12.

8850.—Harrington, J., and Hill, A. W., "Gas-lamp." April 12.

8866.—Page, S. E., "Gas-calorimeters." A communication from H. L. Doherty. April 12.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by Correspondents.]

Future of the Gas Profession.

Sir,—I cannot refrain from drawing attention to a glowing example in this week's "Journal" of what I and several others have written previously under this heading. Two advertisements appear for gas managers—one for a works making 140 million cubic feet, salary offered £200, with house, rates, &c.; and the other making 18 million cubic feet, with a salary of £100, and house, &c. Now, if this is an analogy of appointments in the gas profession, I should be glad to hear the explanation of it.

My opinion is that the former appointment, judged by the wording of the advertisement and the date at which it becomes vacant, is under some body of "sweaters" calling themselves a corporation; and if there are any persons who are willing to take on the job, and thereby sacrifice their self-respect, to become practically a fetch-and-carry drudge possibly for some town clerk and his under-strappers, I pity them, and would fervently warn them (especially any assistant managers who think it would be a good start for them) that they have little conception of what they are undertaking. The present occupant of the berth is no doubt in receipt of double the salary advertised. I cannot imagine there is any consulting engineering advice in this particular appointment. In fact, I can think of nothing that is likely to account for such a piece of palpable serfdom that ought to be impossible in the first country of the world. It really makes one's blood boil to read that any body of men—I suppose calling themselves Englishmen—can be so mean as to authorize such an advertisement. This is an example that should come under immediate investigation by the Institution of Gas Engineers, for means to prevent such a thing being possible.

In conclusion, I implore the Council of the Institution to place it as the very first item on the *agenda* of business procedure for discussion at the annual meeting in June next. If they do not, they will be neglecting their duty to the general body of the members by permitting such a scandal to exist as a menace to the future of the gas profession.

April 19, 1906. One of the Present.

Working of Retort-House Governors.

Sir,—The paper read by Mr. Leslie Wilson, of Stafford, at the last meeting of the Midland Junior Gas Engineering Association, is assuredly clearly and straightforwardly written; and the author merits the congratulations of all those interested in retort-house work for stating what doubtless will be accepted as his convictions. When a man has the courage to state what he does think, it is easy for others with different convictions to point out where they may believe he is wrong. It has been said on more than one occasion that it is sometimes difficult to speak the truth; and this paper proves the statement. It will be well, therefore, for it to be understood at the onset that I accept all the writer of this paper has said as having been stated under the impression that it was true.

The matters that I have to remark upon are the following. The author states:

(1) That with retort-house governors working properly, a gauge-glass connected to the hydraulic main will show very little or no effect when the retort-lids are closed after charging.

(2) If the ascension pipes are of sufficient area, and are kept clear, the pressure in the retorts in which gas is given off at the maximum rate, should not rise above that of the atmosphere. It is only with the help of retort-house governors that these conditions of working become practicable.

(3) Prior to the introduction of retort-house governors, the hydraulic seal at Stafford was kept at an average depth of 1½ inches, and the pull of the exhauster was kept between 5-10ths and 10-10ths; while the make of gas from ordinary Staffordshire coals was 11,527 cubic feet, of 15·6 candles.

(4) Since the installation of the governors, the yield of gas has averaged over 12,000 cubic feet, of a quality of 16·1 candles.

(5) Diagram No. 3 (Longton), taken with the liquid in the hydraulics flush with the bottoms of the dips. The statement is made, evidently referring to Longton experience, that they [the governors] entirely prevent even the very slight fluctuation observable on No. 3; and lines are now obtained every bit as straight as record No. 2.

(1) I can understand that a gauge-glass connected to the hydraulic main will show very little difference after charging, if the retorts are cold. But provided the retorts are hot, and two or three of them are charged with coal and closed up quickly, the suddenly increased quantity of gas to be dealt with is bound to make a marked difference on the gauge. At any rate, this is my experience. If a dry main be used, under certain conditions there might be little variation in the gauge.

(2) I agree that the pressure in the retorts when gas is being given off at the maximum rate, should not rise above that of the atmosphere; but I do not agree that the retort-house governor *per se* has anything to do with bringing about this result. A regular pull on the hydraulic main, if the connections are ample, can be maintained without the use of a governor.

(3) With all respect, I cannot accept the statement that 11,527 cubic feet of 15·6-candle gas was made for any length of time from ordinary Staffordshire coals with a 1½-inch water-seal in the main and only a pull of 5-10ths to 10-10ths of an inch. However, if this can be done, I should much like to have permission to stay in the retort-house at Stafford for 48 hours and satisfy myself; and there are others who would be glad of a similar privilege.

(4) Again, with all due respect to the writer of the paper, I cannot accept the statement that the installation of governors has increased the yield of gas from 11,527 to 12,000 cubic feet, and the illuminating power from 15·6 to 16·1 candles. No theory can be propounded to

support this; and I challenge the possible practicability of doing it with ordinary Staffordshire coals, unless there be an absolutely free way for the gas to travel to the exhausters—and this it was stated by the author was not the case at Stafford. Even with a dry main, a yield of 12,000 cubic feet of 16 1-candle gas from ordinary Staffordshire coal is an impossibility.

(5) With all due respect, I state that it is impossible for any governor to act in such a way that at or near the hydraulic main, after a charge, there should be no oscillation, or even as little as Diagram No. 3 (Longton) shows. If the liquid in the hydraulic main just reaches to the bottoms of the dip-pipes, it is abundantly clear that, when the retorts are carbonizing coal and a full volume of gas is passing up the ascension-pipes and down the dips, water in the main must be displaced in such volume as is equivalent to the sectional area of the dip-pipes. Say, for instance, that the dip-pipes are 6-inch, and the sectional area 36 inches, the water in the main would have to sink roughly 2 inches to let the volume of gas pass; and if the water had to sink 2 inches at each dip in the hydraulic main, it follows that the water would rise and fall intermittently as the gas was coming down the dip into the hydraulic, so that if the gas had a free way (say) every second the dip-pipe would be sealed every other second to a degree dependent on the area of the main at the water-level. The ebullition caused on the surface of the water and the intermittent flow of the gas—the governor being set to keep only a level gauge—would be bound to produce oscillation. The only way I can account for the diagram referred to is that it was taken a long way away from the hydraulic main, or that little or no gas was being made when the diagram was being produced.

I have tried to be short in my remarks. I hope they are not too abrupt, and that Mr. Wilson will be able to prove himself right, or show me where I am wrong in my contentions.

Nuneaton, April 14, 1906. GEORGE HELPS.

Inverted Incandescent Gas-Burners.

SIR,—The paper read by Mr. Victor A. Rettich, before the Illuminating Engineers' Society in New York, contains many points for comment. It states that, after a long discussion at a recent convention in England, the verdict was that the inverted lamp in its present form would not be a success. It does not state what "convention" is referred to, nor what is meant by "its present form."

The writer of the paper suggests that a mantle of thicker cotton, but with interstices of much greater area, should produce one of the same tensile strength as the present, and decrease the back-pressure in the burner while admitting more oxygen to its interior. It would be interesting to know if the writer is aware of the action of the bunsen flame on the mantle. It may with little uncertainty be taken for granted that he is not. A mantle made on the lines he suggests would not emit any light at all. Again, how any back-pressure is caused in an inverted mantle when the top or mantle-holding ring is open, requires a little explanation.

The author proceeds to state that where a light gas of low-candle power is supplied at a pressure exceeding 2 inches, the inverted burner will doubtless give good results. How many places there are in England where these conditions do not exist, is not stated; but if the prior statement as to the conclusion come to at the recent convention is true or consistent, it would appear that there are a good many. It is stated that New York gas is of 23-candle power, and is delivered at a pressure of 12-10ths to 15-10ths; the problem of inverted burners, therefore, being a very difficult one for New York to solve. Where is the difficulty? New York can surely do one of two things—reduce the quality (even if it can only be done by the admission of a percentage of air) or increase the pressure. There is no burner, I think, on the market, or likely to be, that will give a good result with 23-candle gas supplied at 12-10ths or 15-10ths pressure.

The references made to seventeen different burners show a somewhat deficient knowledge of the fundamental principles of atmospheric pressure, if I read the author correctly. The writer further speaks of doubly or trebly folding the mantle, and then sewing it together. If the author of the paper would try his suggestion himself, he would find that his mantle would but break the faster. That the Board of Fire Underwriters in New York have condemned the inverted burner on account of its having been the cause of fires, is not to be wondered at. What is to be wondered at is that gas suppliers or users in such a city as New York supply or employ burners that produce carbon and drop it red-hot.

Certain so-called disadvantages of the inverted burner are set out under twelve different numbers: (1) Dangers of falling particles. (2) Carbonization of the mantle. (3) Flashing-back. (5) Flickering light at low pressure. All these defects cannot surely be traced to the burners—that is, if they are of a fairly good kind—but to the supply of gas or the miserable pressure.

(4) Delicacy of mantle suspension. Whether or no the inverted mantle is strong, depends on the size of it. If an inverted mantle be used the same length as a vertical mantle, I agree that it would not last long; but, on the other hand, the small inverted mantle will last very considerably longer than any vertical mantle.

(6) Discolouration of chandelier arms. (7) In many cases a difficulty of attaching lamps so that they will be gas-tight, when set in the required direction. These defects can be entirely obviated if an up-to-date burner and fitting be used.

(8) Methods of regulating the gas are too coarse; a much more delicate way being required. With up-to-date burners, the regulation of the gas may be effected to the finest degree possible.

(9) Liability to break mantles when removing glass. This remark is just as applicable to vertical as to inverted burners.

(10) Variations in the diameter of globe-rings, &c. This is not a question of the burner, but of the glass, and is also applicable to vertical burners.

(11) Variations in means of affixing mantles to burners. This is not a defect of the inverted burner; and doubtless it will very speedily be removed when the best types of burners are accepted and the method of fixing mantles standardized.

(12) Too much heat thrown off in proportion to the quantity of gas used. This remark is quite erroneous. If the burner is anything like respectable, the light thrown in the direction required can be obtained by creating far less heat than by any vertical burner.

All the criticisms of the seventeen burners, to my mind, show that the writer of the paper has had very little to do with burners.

The author speaks of "potential energy." What he means by this, in the case in which he uses it, I do not know. He also says that some people—and he appears to be one of them—contend that "to burn gas downwards at the ordinary pressure of less than 2 inches is like trying to send water up-hill without the requisite force in the pumps." The difference in the atmospheric pressure in 10 feet is 1-10th inch of water, and equal to 1-1200th of the height. The pressure that the gas and air in an inverted burner have to overcome is the weight of a column of water 1-1200th of the length of the burner—or in a burner descending 6 inches, 1-200th of an inch—and this difference, if the burner has been properly constructed, can be readily neutralized.

The only redeeming feature in the paper concerned is the last sentence but one: "When the designer of fittings gets in his good work, by constructing them to suit the burner, an enormous field will be opened up, and the public will welcome the advent of an appliance that will give the decorative effect of an electrolier, but with more light and at greatly reduced cost."

I have ventured to call attention to these several points because readers of the "JOURNAL" generally expect to learn something from their brethren "across the pond;" and the paper in question is, so far as I understand, most erroneous and misleading.

Nuneaton, April 14, 1906. GEORGE HELPS.

Electricity at Hastings.

SIR,—I see in your issue for the 17th inst. that you refer to the substitution of incandescent gas-lamps by flame arc lamps in certain streets of this town, and I need scarcely say I endorse your comments. As your readers are interested in this matter, I venture to give you the following information as regards the present scheme, which is a remarkable one in many ways.

The "Oliver" flame arc lamp is economical in current and in regard to labour for trimming; but the carbons, like other flame arc lamps, are somewhat expensive. It is proposed to use tramway standards as the columns in most of the cases; and the gas-lamps displaced are the property of the Corporation. As you will be aware, we have had some arc lighting in Hastings for a good many years, and the figures (condensed) are as follows:—

—	53 Arc Lamps on Front. (Partial Lighting.)	51 Arc Lamps in Streets. (Partial Lighting.)	New Flame Arcs. (Burn all Night.)
Current	£28 15 0	£23 14 0	£10 0 0
Attendance and repairs	12 5 0	5 0 0	
	£41 0 0	£28 14 0	£10 0 0
Interest	7 4 10	3 13 6	2 15 0
Total	£48 4 10	£32 7 6	£12 15 0
All lamps	£2556 16 2	£1651 2 6	£255 0 0

It was suggested that in this matter Hastings is following the example of Islington. Poor Hastings! I cannot attempt to explain the above figures. It is, however, significant to remember that in 1900, when the arc lighting was last extended, the following estimate was submitted and passed by the Council; and you will note how it compared with the (then) cost of the existing gas lighting. These lamps, or rather the 51 which were used instead of the 49 proposed, appear in the official record for the current year as the estimate given below. They are also included in the above record.

Estimated Cost.

	Annual Cost of Each Class of Lamp.	Total.
Five 15-ampere arc lamps (burning from dusk till 11 p.m.)—current consumed, 1400 units, at 1¼d. per unit	£7 5 10	
Interest and sinking fund on capital expended on arc lamps and posts, 6½ per cent. on £45	2 18 6	
Cost of carbons, trimming, and repairs	3 1 6	
	£13 5 10 ..	£66 9 2
Forty-four 12-ampere arcs (burning from dusk till 11 p.m.)—current consumed, 1100 units, at 1¼d. per unit	£5 14 7	
Fixed charges as above	6 0 0	
	£11 14 7 ..	516 1 8
One hundred 16-candle power incandescent lamps—current consumed, 180 units at 1¼d. per unit	£0 18 9 ..	93 15 0
		£676 5 10

Cost of Existing Gas, £649 16s. 4d.

Present Cost.

Fifty-one arc lamps in streets (burning from dusk till between 11 p.m. and 12 p.m., with two 16-candle power incandescent lamps burning till dawn)—		
Approximate amount of current consumed, 1792 units, at 1¼d. per unit	£11 4 0	
Approximate lamp charge, at £15 per kilowatt	12 10 0	
Interest, &c., on lamps, posts, &c.	3 13 6	
Estimated cost of repairs and attendance	5 0 0	
	£32 7 6 ..	£1651 2 6

The italics are mine, and you and your readers will agree that the

ratepayers of Hastings pay heavily for the questionable privilege of dealing at their own shop.

CHAS. F. BOTLEY.

Hastings, April 20, 1906.

P.S.—The total cost of the public lighting is about £10,200 per annum. Four miles by electricity cost £4200; the rest of the town lighted by gas, £6000.—C.F.B.

Coal Conservation, Power Transmission, and Smoke Prevention.

SIR,—Your issue of the 3rd inst. contains, on pp. 18 and 19, an article dealing with the paper, headed as above, which I read before the Society of Arts on the 28th ult. The writer has formed a very poor opinion of my paper; and it is doubtless useless for me to attempt to change it. But I may perhaps be permitted to clear up a few points on which he appears to have misconstrued me.

He states that, in referring to the recent report of the Royal Commission on Coal Supplies, I made "an important deviation." The Commissioners quote an opinion expressed by the District Commissioners, to the effect that, "owing to physical considerations, it is highly improbable that the present rate of increase of the output of coal can long continue." I say in my paper ". . . the pressure of the demand upon the supply, and the exhaustion of the beds which are most easily worked, will bring about a rise in price which will act as a powerful brake upon consumption." If this difference in wording constitutes an "important deviation," I can only say that the deviation was not intentional.

The contents of my paper are characterized as "frightful pictures," "the affraying argument," "such alarmist theorizing and vain imagining," and so on. Whether this description is a fair one, or whether my critic's language is more temperate than my own, I will leave the reader to judge. My aim in writing the paper was to let the figures speak for themselves—studiously avoiding anything sensational in my remarks concerning them. If, then, the picture is a "dreadful" one, it is so by virtue of the facts themselves. Your writer asks: "If our stock of coal will not be exhausted within any such period as he has named . . . what can be the point of his futile calculation"? To the best of my belief it is both customary and legitimate, in referring to the stock of any commodity, to express it in terms of the annual consumption, having due regard to the rate of increase or decrease in the latter. Had I been content, as your writer suggests, to indulge in "pure prophecy and imagination," I might have formed my own estimate of the future rate of consumption. But as I preferred to rely on ascertained facts, I took the actual rate of increase in consumption as given in the official returns. This constitutes the "head and front of my offending."

My statement that "at no very distant date a cheap and abundant supply of coal, such as we enjoy to-day, will have become a thing of the past" is set down as "a mere *dictum* based on no evidence of facts." If the evidence collected by the Royal Commission as to the exhaustion of the shallower collieries and of the beds which are more easily worked, and the steady increase in cost of working, is not evidence of facts, the responsibility does not rest with me, but with the Commissioners and their witnesses. That the Commissioners themselves regard a falling off in the supply of coal as neither remote nor improbable, is clearly shown by the anticipation, expressed in their final report, "that the present rate of increase in the output will soon be checked by natural causes," and that the output will then begin to decline.

The question of whether those who come after us have any claim on our consideration, or whether the ownership of property involves rights as well as privileges, is too large to be threshed out here.

I trust that I shall not be suspected by your readers of any indifference to the value of "character" when I confess my inability to follow your writer in his belief that it can take the place of the material necessaries of life. He fances that some of us might prefer starvation to recourse to chemical fertilizers; and I fear that the former of these alternatives will be the lot of those who stake their existence on character, to the exclusion of more solid sustenance. The English nation, before the hewing of coal, comprised at the outside from one-third to one-half the population of Modern London; and the scale of living in those days was such as the worst-paid labourer of the present time would not willingly conform to. Moreover, we have not even the advantage, which our forefathers possessed, of extensive forests from which to obtain a supply of fuel. With these facts in view, was I so very far wrong in asking whether our existence as a nation may not be said to depend on our coal supplies?

In dealing with the latter part of my paper, my critic falls into some slight inaccuracies. The half-dozen undertakings from whose published returns I derived my net cost of manufacturing gas, did not include a chemical works. Nor do I leave to the imagination the stupendous capital required to establish the necessary gas-works. On the contrary, I expressly included for manufacturing plant the sum of 3s. per 1000 cubic feet per annum, which for 180,000 million cubic feet works out at £27,000,000. If the "existing works" to which he refers are those of the London Gas Companies, he is correct in stating that I have provided nothing for their purchase, for the simple reason that, whatever his views on the subject may be, it did not occur to me that the distribution of the Metropolitan Gas Supply could be in better hands than at present. While on this point, I may add that I could wish for no better guarantee for the success of a scheme of gas transmission than that it should be carried out under the auspices of the existing Companies.

It is disconcerting to learn from my critic's concluding remarks that the adoption of my proposals would tend neither to the conservation of coal nor the transmission of power, nor yet to the prevention of smoke. He is particularly emphatic in his assertion that the cheapening of gas would augment the consumption of coal and expedite its exhaustion. The witnesses before the Royal Commission, on the other hand, are equally positive that the substitution of gas for coal would bring about an immense reduction in the consumption of the latter; and the Commissioners themselves express a strong opinion to the same effect.

As regards smoke prevention, also, there seems to be a strong consensus of opinion that no better means can be found for the purpose than the substitution of gas for coal. Sir George Livesey, in his address (as Chairman) to the Smoke Abatement Conference, said that the "great desideratum for smoke abatement is cheap gaseous fuel" If, therefore, I am as mistaken as your contributor supposes, I have the satisfaction of erring in good company.

As a parting shot, he characterizes my proposals as the product of "a megalomaniac" imagination. Much as I might desire to appropriate this graceful compliment to myself, I must yield to the prior claims of the Royal Commission and those of their witnesses, who anticipated me in recommending the transmission of power from large central stations established at the collieries.

ARTHUR J. MARTIN.

7, *Victoria Street, S.W., April* 19, 1906.

[It is not surprising that Mr. Martin, in his letter, makes no attempt whatever to controvert what we stated to be the fundamental fallacy underlying his paper and all such similar speculations. That fallacy consists in taking present raw materials, assuming the continued increase in their demand and necessity under future unknown conditions, and thus drawing erroneous and suppositious deductions as to their exhaustion and its calamitous effect. It is the same old fallacy that sees in the introduction of any new servant of mankind the extinction of previous ones. Thus, coal gas was going to sweep away all candles; and even quite recently, the electric light was to oust gas altogether. So, too, at the present time, if one of Mr. Martin's "simple calculations" were made, it might be shown that *if* the present rate of increase in putting motor-omnibuses on our roads were to continue, there would soon be no room for anything else. The common-sense Britisher need not worry, and does not, about such far-off and unpractical questions as to how future generations will look after themselves.

Turning to the minor points in Mr. Martin's letter, he frequently tries to shield himself behind the Royal Commission's report on our coal supplies. But this report distinctly stated that the present rate of increase in the output of coal in this country would soon be checked; whereas Mr. Martin's calculations are based on the rate of increase being maintained, as he repeats more than once in his paper. This difference of attitude we say constitutes an "important deviation" from the Commissioners' report. The quotation given by Mr. Martin in the second paragraph of his letter is one that was not read by him at the Society of Arts meeting, and does not affect the deviation we have pointed out. It might be gathered from the communication that Mr. Martin repudiated indulging in prophecy and imagination in his paper. But in a letter of the 18th inst. to an engineering contemporary (which also referred to his "mountain of prophecy"), he is hardly so emphatic; for he writes: "If there is one thing more than another which I had in view in writing my paper, it was to keep clear of prophecy; and I am disappointed to learn that I seem to have failed to do so."

The slight inaccuracy of our having thought that gas from a chemical works had been included in Mr. Martin's list of half-a-dozen places is easily explained by quoting the confused sentence which misled us: "The corrected cost of gas at Lancaster comes very near the lowest cost of which I have any record—viz., 1d. per 1000 cubic feet; the gas in the case in question being obtained as a bye-product at some chemical works." As regards the sum of 3s. per 1000 cubic feet per annum for manufacturing plant, this was only given incidentally in the "provisional estimate," and nowhere was the small item of £27,000,000 mentioned. We note that Mr. Martin admits that he provided nothing in his estimate for the purchase of the London Gas Companies' works—apparently because they are to have the inestimable privilege of distributing his colliery-made gas. Such a reason is quite in keeping with the paper itself; being based on the fair ground that if one uses part of a whole, no purchase price need be paid.

Another charming instance of Mr. Martin's inconsequent reasoning is to be found in this: We said that "any cheapening in the sales of gas . . . would obviously increase the demand, and so augment the consumption of coal"—a commercial truism, we should have thought, and happily the experience of gas companies generally. In contradiction to this, Mr. Martin says that witnesses before the Royal Commission were "positive that the substitution of gas for coal would bring about an immense reduction in the consumption of the latter." We quite agree that the mere substitution of gas for coal would have this effect. But this has nothing whatever to do with the point in question, which was the *cheapening* of gas, and not the *substitution* of coal for gas. So, too, as regards smoke abatement. We agree that cheap gaseous fuel is a great desideratum. And it is exactly because gas or coal for domestic heating purposes is a question primarily of cost or taste that the Coal Smoke Abatement Society have so far made such little popular progress.

Lastly, the Royal Commission did not recommend the transmission of coal-gas to London from South Yorkshire collieries; and therefore Mr. Martin need not hesitate about taking to himself any credit for his own impracticable proposals.—ED. J.G.L.]

MISCELLANEOUS NEWS.

CHELTENHAM GAS BILL.

The Town Council and the Agreement.

A Special Meeting of the Cheltenham Town Council was held last Wednesday, for the purpose of considering the agreement come to on the subject of the Gas Company's Bill. The agreement—the terms of which were given in last week's "JOURNAL"—was to the effect that opposition to the Bill should be withdrawn on certain conditions.

Alderman NORMAN, in moving the adoption of the minutes of the General Purposes Committee containing a review of what had been done, said it had been suggested that there was no need for calling the Council together, as the Committee had been authorized to take the responsibility on themselves, and might have obtained an indemnity from the Council afterwards. The Committee generally had, however, thought that it would be more satisfactory to have their responsibility shared at this stage by the Council, and that it would be also more satisfactory to the Gas Company to know that the terms on which they had come to a provisional agreement had been endorsed by the Council whom the Committee represented. The meeting had really to approve the suggestions for clauses in the minutes; but the exact clauses had not yet been agreed on, though they had been drafted. He did not know whether there was anything in the atmosphere of Cheltenham which prevented negotiations from being conducted so smoothly there as they were in London; but he understood that one or two points had arisen out of their agreement, on which points the Committee must still preserve the right to prevent any whittling away of the terms on which they had throughout insisted as the very minimum to which they were entitled. Even at the last hour they must, therefore, reserve the right to oppose any clauses in order to get what they required before the House of Commons Committee. Under the arrangement they had come to, they had, however, already obtained a good deal that had been originally required by the Council. In the passage of the Bill through Parliament, they would have probably got by opposition more they now expected to get by agreement, because all the clauses and conditions they had originally deemed to be necessary to safeguard public interests had been from time to time embodied in Acts of Parliament similar to that now asked for by the Company; and these clauses and conditions were such as the present Parliament would be particularly likely to give them as a public body. But whether the balance which they had not obtained under the agreement would be worth the extra cost of opposition in Parliament, was, of course, a very grave and doubtful question. The Committee considered that what they had obtained was the extent to which they might reasonably go in insisting; and that, under the circumstances, the Council should give up the other points in dispute. They had been especially led to take this view because it was somewhat doubtful whether they would have been able by direct opposition to get a clause embodied in the Bill to prevent the Company's pollution of the sewer near their works. The ground for this doubt was that their aim could have been achieved only by amending their own Improvement Act of 1852 by a clause in the new Act promoted by the Company for quite another purpose. True, they had been advised that it was extremely likely that they would succeed even on this point; but as there was some little doubt with regard to it, the Committee thought the Council would, on the whole, be well advised to make some little sacrifice in other directions in order to do away by agreement with the section of the Act of 1852 which had been such a great source of complaint and disadvantage to the Council for many years past. They had made no attempt to oppose the preamble of the Bill, and entirely confined themselves to clauses. There was no blinking the fact that the Bill proposed to decide important matters with which they had not interfered, but on which something might be said adversely in the public interest. For instance, the Company wished to extend their area. Well, the Committee had raised no objection to this, though the proposal was open to the remark that during the time the added area failed to pay, the customers in the old area would have to make good the deficiency. Then the reduction of the illuminating power was a grave matter. The Company proposed nominally to reduce the illuminating power from the 15-candle power which the Council succeeded in obtaining in 1896, to 14; but the accompanying change in the method of gauging the illumination would reduce it still more, and the power would certainly be under 13 candles as compared with the old standard. This was a serious change; but they had to balance it against the statement that it would make the gas cheaper, and that it did not lessen the efficiency of the gas in its crude state for the purposes for which it was now chiefly required—viz., for power, for heating stoves, for cooking, and for mantles for incandescent lighting. The abolition of the process of purification from sulphur was also, to his mind, a matter of serious import. But the process was an expensive one; and if it could be done away with without injury to health, as was contended, this also would tend to cheapen the gas. But even if the presence of so much sulphur in the gas could not be inimical to human beings owing to its undergoing chemical changes in the burning, yet the fumes would be unquestionably prejudical to decorations, to the bindings of books, &c. Fortunately, in Cheltenham, as in other places, the people who wanted a pure healthful light which would injure neither them nor their furniture had but to resort to electricity. Further, this point had been reserved for parliamentary consideration without their interference, as a battle royal was about to begin between the associated corporations and the associated companies on this very subject. In view of the concessions they had obtained, they had foregone their claim to a sliding-scale. Here, again, they had a check on the Gas Company in the competing undertaking possessed by the Town Council.

Mr. PARSONAGE seconded the motion.

Mr. MERRETT said that he understood the Company undertook to provide new flat-flame burners for the coin-meter consumers. From what they heard with regard to the illuminating power and the absence of the sulphur test, it was the poorer consumers who would be in a rather lamentable condition, as the gas it was proposed to make would be scarcely fit for flat-flame burners. Perhaps they might come to an understanding with the Company to provide incandescent burners, which would remove the great objection to the reduction of the illuminating power and the discontinuance of the sulphur test.

Mr. GREEN asked for a little further information upon the sewage question, saying that it was not only the smell they had to complain of, but the injurious effects of the gas refuse upon the soil at their outfall at the sewage farm.

Alderman NORMAN, in reply, said he was afraid he could give nothing more definite than was contained in the minutes on the sewage question. The clause was one upon which they had the severest struggle, and it was one upon which some difficulty still remained. He did not see how they could go further than they had done. They had used the words of the Rivers Pollution Act; and that was the general law with regard to such fouling. He did not think Parliament would put them beyond the general law of the land. The difficulty with which they had to deal was the section of the Act of 1852, which gave the Company the right to turn their refuse into the Severn. This right they had exercised to the serious detriment of the sewers, and the outfall at the sewage farm. All the Council could hope to do was to remove whatever special power the Company had under this section, and get them under the general law. With regard to Mr. Merrett's point as to the burners, they were assured by the Company that the new burners they would substitute would give a light equal to those at present in use with higher illuminating power gas. The question of the damage the sulphur might do in rooms must, of course, be subject to the remarks he had made with reference to their liberty to oppose the Bill upon this point when it came before the House of Lords. If no harm was done by sulphur, cottagers would not suffer; if injury were done, then it would be their bounden duty to protect the poorer consumers.

The motion was carried unanimously.

NEW GAS-WORKS AT AYR.

Our Scotch Correspondent, in his notes in last Tuesday's issue, made very brief reference to the completion of an extensive scheme of renovation of the works of the Ayr and Newton Consumers' Gas Company. He explained the reason why he was unable to give anything like an account of what had been done; but the columns of the local Press enable us now to an extent to make good this deficiency.

The present make of the Company is 60 million cubic feet per annum; and the new plant will allow of this being increased to 100 millions, while with very slight further extension an output of 150 million feet can be reached. The additions consist of a retort-house, retort-bench, and mountings, boiler, condensing plant, washer-scrubber, exhauster-house, and holder. The retort-house is capable of manufacturing 500,000 cubic feet of gas per day of 24 hours; the condensers will be able to deal with a like quantity; while the washer-scrubber can deal with 750,000 feet per day. There are two exhausters—one for working during the day and the other at night. The capacity of the gasholder is 484,500 cubic feet. The Contractors for the work were: Retort-house, Messrs. Gregory and Co., of Glasgow; retort-bench, brickwork, and chimney, Mr. Workman, of Saltcoats; retort-bench mountings, Messrs. Balfour and Co., of Leven; condensers and holder, the Barrowfield Iron-Works Company, of Glasgow; scrubber-washer, Messrs. Holmes and Co., of Huddersfield; exhausters, Messrs. Waller and Sons, of London; and excavations for holder and tank, Messrs. W. Watson and Sons, of Ayr.

At a lunch which took place in connection with the opening ceremony, Mr. W. Smith, of Bolton, proposed "Success to the Newton Gas Company;" remarking that the Directors deserved great credit for the present structure. He said the Company had an excellent Manager in Mr. John Gibb; and that he regarded the future of the undertaking as assured. The Chairman (Mr. R. M'Vicar), in acknowledging the toast, dealt at some length with the history of the concern. He said that in 1884 the price of gas was 5s. 4d. per 1000 cubic feet in Newton, 6s. 3d. in Preswick, and 6s. 8d. in Monkton—they differentiated between the places according to the distance removed from the works—and the total revenue was a modest sum in four figures. To-day the price was 2s. 11d. to all consumers; and notwithstanding that the charge was less than half that made in 1884, the revenue now was a very respectable sum in five figures. In 1884, the capital was £10,000; and between then and now he dared say they had spent in one way and another more than five times the amount, and they had a bran new works, thoroughly up-to-date, furnished and equipped with every modern appliance for obtaining the best results with the minimum of cost. Subsequently the Chairman was presented on behalf of the Contractors with a pair of silver candelabra, and the Vice-Chairman (Mr. James Wilkinson) with a silver claret tray.

EPSOM RATEPAYERS AND THE GAS COMPANY.

The Question of Standard Price.

The Epsom Urban District Council having decided not to oppose the Bill of the Epsom and Ewell Gas Company, which provides for a standard price of 4s. 6d. per 1000 cubic feet, the local Ratepayers' Association determined to take action on their own account; and to this end, they addressed a communication to the Chairman of the Private Bills Committee of the House of Commons praying for the reduction of the standard to 4s.—thus following the course adopted by the Epsom Rural District Council. The Committee lowered the figure to 4s. 3d.; but as this did not satisfy the Association, they have invoked the assistance of the Committee of the Lords in charge of Private Bills. It is said that the Urban District Council, who own an electric light

installation, thought it unnecessary to take action in the matter, on the ground that competition would render very remote the possibility of any unreasonable charge being made by the Gas Company.

At their last meeting, the Council had before them a letter from the Association urging them to support, for the following reasons, the action which the Association have taken in endeavouring to obtain a further reduction of the standard price when the Bill is in Committee of the House of Lords: (1) That consumers of gas in this district are not adequately protected by the fact that the Epsom Urban District Council have an electric generating plant, as the Council supply current to only a portion of the district supplied by the Gas Company, and that even in this part of the district the price charged by the Council for lighting is high, and that for heating and cooking purposes the price is practically prohibitive. (2) That the residents of the district have a right to look to the Council to take all reasonable steps to prevent the Epsom and Ewell Gas Company, who have a monopoly in the district, obtaining power to charge an exorbitant price. (3) That the Epsom Rural District Council have shown themselves to be in accord with the views expressed by the Association on this subject by writing to Parliament in a similar way. (4) That the standard price is the basis of the sliding-scale of dividends and price; and the lower it is fixed, the better it is for the consumer. (5) That in Sutton and Cheam the standard price for gas is fixed, by the Act of 1904, at 3s. 2d.; and that the price charged for gas in Sutton is consequently 2s. 6d., against 3s. 7d. charged in Epsom. The Council, however, did not decide to take any action in the matter.

The following is the text of the letter addressed by Mr. George Clayton, the Hon. Secretary of the Ratepayers' Association, to the Chairman of the Private Bills Committee of the House of Lords.

My Lord,—I am desired by the Committee of my Association to approach you on the subject of the Epsom and Ewell Gas Bill, 1906, which passed its third reading in the House of Commons on March 20 last.

By section 26, the standard price, upon which the sliding-scale of charges for gas is based, is fixed at 4s. 3d. per 1000 cubic feet when the Gas Company are paying 5 per cent. dividend and placing 1 per cent. to a reserve fund. My Association respectfully venture to submit that this proposed standard price is unreasonably high; and I am desired to observe that in the town of Sutton, situated only 4 miles from Epsom, under the Act of 1904 (4 Edw. VII., c. 14) the standard price of gas for Sutton and Cheam is fixed at 3s. 2d., and also to submit a statement showing the standard prices and the actual prices charged, in a number of neighbouring towns—these prices having been extracted from the Parliamentary Return No. 320, 1905, House of Commons.

My Association further desire me to submit: (*a*) That in the case of a monopoly it is undesirable to fix an unreasonably high price as a standard. (*b*) That a high standard price is not likely to result in economical management of the Gas Company. (*c*) That in Sutton, where the standard price is 3s. 2d., the price charged for gas is 2s. 6d., as against 3s. 7d. in Epsom. (*d*) That these high charges press very hardly on the working-class population of Epsom.

I am therefore to respectfully urge that the standard price in the case of the Epsom and Ewell Gas Company may be fixed either at the standard price fixed in the Sutton Gas Act, 1904—viz., 3s. 2d.—or, as an alternative, that the standard price should be the average for the seven Surrey towns instanced in the accompanying statement—viz., 3s. 8d.

[Copy of Statement Annexed.]

	Standard Price.	Actual Price.
Chertsey	4s. 0d.	3s. 4d.
Croydon	4 7	2 8
Guildford (within a radius of 2 miles)	3 6	3 6 (less 7d. discount within 2 miles)
Kingston (below 2s. 11d. for average of dividend)	3 6	2 10
Redhill	3 6	3 4
Richmond	3 3	2 10
Sutton (under old Act)	—	3 4 (less 6d. discount)
Sutton (under 4 Edw. VII., c. 14, 1904)	3 2	2 6 (price in 1906)

EXHIBITION OF GAS APPLIANCES IN ABERDEEN.

An exhibition of gas appliances, of greater than the ordinary magnitude, held under the auspices of the Corporation of Aberdeen, was opened in the Music Hall of the city by Bailie Esslemont on the afternoon of Wednesday last, and remains open until next Saturday. Its object is stated to be to bring under the notice of gas consumers in Aberdeen the latest gas heating appliances for domestic, laboratory, and industrial purposes, and by a series of lectures (by Miss E. M. Dods) to demonstrate to the public the many advantages of gas-cookers; also to show the latest in incandescent gas lighting, including self-intensified and high-pressure systems. The exhibition is admirably housed. It was arranged under the supervision of Mr. Samuel Milne, the Gas Engineer to the Corporation, who is to be congratulated upon the fine display he has been able to make.

A few of the exhibits may be noted. Messrs. Moffat's Limited, show the Lucas light, by which also the illumination of the lower portion of the hall is effected—there being four lamps, of 400-candle power each, in the centre; while under the galleries Sydney lamps are used, 12 feet apart, each containing three inverted burners, of 80-candle power each. Messrs. John Wright and Co., Limited, show a large collection of cooking and heating appliances, water-heaters, and the like. Messrs. James Keith and Blackman, Limited, exhibit their method of high-pressure lighting by means of water-driven compressors. They light the upper part of the hall by means of three lamps of 300-candle power each, also the platform, by two single-burner lamps, each giving a light of 300 candles. Messrs. Alder and Mackay have on view a demonstration meter, of the prepayment sort, which shows the quantity of gas supplied for a penny. It furnishes gas to both a flat-flame and an incandescent burner, which burn alternately—illustrating the superiority of the latter. They have also a patent lighting apparatus, which can be operated from the gas-works. The Richmond Gas Stove and Meter Company, Limited, show a large assortment of their goods, including a water-heater which can be attached to the existing hot-water pipes in a dwelling-house, and by which, with a consumption of 8 cubic feet of gas per hour, water can be kept at a scalding heat, as is demonstrated on the stand. Messrs. R. & A. Main, Limited, show gas-cookers and water-heating apparatus in great variety. The Carron Company have a most up-to-date stand of gas cooking and heating apparatus; and the same may be said of the stand of Messrs. Fletcher, Russell, and Co., Limited. There are, in addition, exhibits, chiefly in lighting appliances, by Messrs. Turnbull Bros., Limited, of Aberdeen (who show the Humphrey Lamp), Messrs. Lawson, Turnbull, and Co., Messrs. Falk, Stadelmann, and Co., Limited (who exhibit lamps with Veritas mantles), and Mr. Walter Simpson, of Aberdeen (who shows the goods of the Welsbach Company).

A large audience assembled for the opening ceremony, which was presided over by Mr. G. Kemp, the Convenor of the Gas Committee. Bailie Esslemont, in the remarks he made, said that the first exhibition of gas appliances in Aberdeen was held in Marischal College in 1881. After that the Corporation opened the present depôt for the sale and hire of gas stoves and other appliances; and during the 25 years since then a fair amount of success had attended their efforts in this direction. They had now on hire 2207 stoves and 397 gas-fires—a total of 2604—but these figures represented a comparatively insignificant number, when they thought that in Aberdeen they had no fewer than 39,000 gas consumers. In this exhibition, they wished primarily to promote the success of the gas undertaking; but the Gas Committee were studying also the interests of the consumers, and he hoped the exhibition would prove not only interesting but useful and most educative. The Town Council owed a hearty vote of thanks to the exhibitors; and he was sure they all desired that at the close of the exhibition the parties who had assisted the Council by favouring them in that manner would find their visit had been a profitable one from a business point of view. Mr. Mackay, of Messrs. R. & A. Main, when acknowledging the vote of thanks on behalf of the exhibitors, said that the Corporation of Aberdeen had shown a great deal of enterprise, not only by hiring gas-stoves at very moderate rentals, but also by arranging to have them fitted up free of charge.

On the evening of the opening day, Mr. Samuel Milne delivered a lecture upon the "History of Gas Lighting." There was a large audience, who were highly gratified at the lucid way in which Mr. Milne treated his subject. The lecture was illustrated by numerous lantern slides. In closing, Mr. Milne said that the Aberdeen Gas Company was founded in 1824. The works were erected at Poynernook, a little to the east of the present joint railway station. For the first four years only oil gas was manufactured; and the price of it was from 40s. to 50s. per 1000 cubic feet. In 1844, the Aberdeen New Gas Company was formed, in opposition to the other Company; and they erected their works at Sandilands, on the site of the present gas-works. At that time gas cost 9s. per 1000 cubic feet. In 1846, the two Companies were amalgamated; and the works at Poynernook were abandoned. The undertaking was transferred to the Corporation in 1871; and the price of gas was reduced to 5s. 5d. per 1000 cubic feet. At the date of the transfer, the quantity of gas manufactured in a year was 146,256,000 cubic feet. In 1905, 666,330,000 cubic feet were made; and the price is now 2s. 9d. per 1000 cubic feet. A hearty vote of thanks was accorded to Mr. Milne.

MOND GAS AND POWER TRANSMISSION.

The following letter on the above subject, by Mr. Arthur J. Martin, in reply to Mr. Emile S. Mond's communication to the "Journal of the Society of Arts" reproduced in our columns last week (p. 169), appears in the current issue of that publication:—

While I appreciate his [Mr. Mond's] willingness to furnish me with information as to the cost of manufacture and transmission of gas, his statement of the former does not materially affect the comparative table of Mond gas and coal gas which he calls in question. He appears to be under the impression that the costs given in this table are intended as the lowest costs of the respective gases. This is not the case. The object of my paper being to show the economy of gas as a medium for the transmission of power, I did not feel justified in taking it at its lowest cost, but preferred to use figures which left a substantial margin against myself. The cost given for coal gas is, as stated, an actual cost; and I understand that Mond gas also is actually made at or about the figure which I have assumed for it. The cost of the coal from which the coal gas was made was 8s. 4¾d. per ton; and it would obviously have been unfair to compare, as Mr. Mond suggests, the cost of this gas with that of Mond gas made from coal at 6s. or 3s. 6d. He tells us that, with coal at the latter price and sulphate of ammonia at £12 10s. per ton, "the bye-products more than pay for the actual cost of the gas, and leave a considerable sum over towards the cost of compression and transmission." This is certainly a striking illustration both of the value of the Mond process and the economy of gaseous fuel. But if we give coal gas also the benefit of coal at 3s. 6d., the bye-products will not only pay for the gas, but will defray the entire cost of compression and transmission, and leave something over towards interest and depreciation on the cost of the manufacturing plant. The adoption of Mr. Mond's basis, therefore, does not displace coal gas from its position as the more economical medium for long-distance transmission. It should not be overlooked that these negative costs are contingent on a supply of bituminous slack at 3s. 6d. per ton; and, while accepting Mr. Mond's statement that slack can be had at this price at the present time, I am not satisfied that this would continue to be the case if gas were generally used in place of coal. I trust that it is not necessary to add that the foregoing remarks do not imply any disparagement of the Mond process, the value of which, both from a coal user's and a national point of view, must be apparent to all. I may further point out that the case dealt with in my paper, involving as it does a distance of 173 miles, is the most unfavourable to Mond gas, and that for shorter distances the disadvantage due to the bulk of the latter becomes proportionately less.

LABOUR BILLS IN PARLIAMENT.

In the "JOURNAL" for the 3rd inst., reference was made in the editorial columns to the proposed legislation in regard to labour which is now engaging the attention of Parliament. Our readers are aware that the Government have introduced a Trade Disputes Bill and a Trades Unions and Trade Disputes Bill has been presented by Mr. Hudson, the Member for Newcastle-on-Tyne, who is supported by Mr. Keir Hardie and other members of the Labour party. In view of the far-reaching effect of these measures, the Employers' Parliamentary Council have issued some observations upon them which it may be of interest to our readers to reproduce.

Dealing first with the Trades Unions and Trade Disputes Bill, they point out that clause 1 provides as follows:—

> It shall be lawful for any person or persons, acting either on their own behalf or on behalf of a Trade Union or other association of individuals, registered or unregistered, in contemplation of, or during the continuance of, any trade dispute, to attend for any of the following purposes at or near a house or place where a person resides or works, or carries on his business, or happens to be: (1) For the purpose of peacefully obtaining or communicating information; (2) for the purpose of peacefully persuading any person to work or abstain from working.

Turning to the Government Bill, the Council direct attention to clause 2, which runs as follows:—

> (1) It shall be lawful for one or more persons, acting on their own behalf or on behalf of a Trade Union in contemplation or furtherance of a trade dispute, to attend, peaceably and in a reasonable manner, at or near a house or place where a person resides or works or carries on business or happens to be, if they so attend merely for the purpose of obtaining or communicating information, or of persuading any person to work or abstain from working.
>
> (2) Section seven of the Conspiracy and Protection of Property Act, 1875, is hereby repealed from "attending at or near" to the end of the section.

The Council lay stress upon the object of these clauses, which, they say, is to legalize intimidation. They permit persons on strike, or persons acting on their behalf, to terrorize workmen who are willing to work and who will not obey the dictates of labour Unions. "Peaceful persuasion" is a misnomer; the real object and the real act of the "persuader" are intimidation pure and simple. The clauses legalize intimidation even in a private house, where a workman's family could be subjected to an organized system of terrorism until he was reduced to subjection to the Trade Union. The clauses would, if enacted, nullify the decision in the case of *Lyons v. Wilkins*, which for the first time clearly and authoritatively defined the meaning of section 7 of the Conspiracy and Protection of Property Act, 1875. This section was, however, limited by a provision to the effect that attending at or near the house or place where a person resides, works, carries on business, or happens to be, or the approach to such house or place, in order merely to obtain or communicate information, should not be deemed "watching or besetting" within the meaning of the section. The Court of Appeal decided on Dec. 20, 1898, that the words "to obtain or communicate information" were to be understood in their ordinary and natural sense, and did not cover the totally different procedure of argument and persuasion. The Council declare it to be untrue to say, as has been alleged by certain officials of labour Unions, that the judgment debars workmen from the right which all citizens possess of spreading their views by argument. It merely requires that they should carry on their argument in such a place and in such a way as not to be a nuisance to a former employer, or to his workmen or the public. That the Trade Unions do not really believe in their own interpretation of the law is clear from the fact that at the last moment they abandoned their appeal to the House of Lords, and left the decision of the Court of Appeal unchallenged. In 1902 also, in the well-known Blackburn picketing case, certain Unions paid damages and costs rather than go into Court; and more recently the Amalgamated Society of Railway Servants paid to the Taff Vale Railway Company no less a sum than £23,000 without venturing to take the opinion of the Court upon the various legal questions involved.

The Grand Committee in 1905 added the following proviso to clause 1 of the Trades Unions and Trade Disputes Bill: "Provided that no person shall, after being requested by any person annoyed by his conduct, or by any constable instructed by such person, to move away, so act as wilfully to obstruct, insult, or annoy such person." Clause 1 of the Trades Unions and Trade Disputes Bill, and clause 2 of the Government Bill, quoted above, would do far more than merely place peacefully persuading on the same footing as peacefully obtaining or communicating information, which is the professed object of the two Bills.

As was pointed out during the proceedings last year, and as the majority report of the recent Royal Commission emphasizes, there is a vast difference between saying that certain kinds of acts "shall not be deemed a watching or besetting" and saying that "it shall be lawful" to do those acts. In the first case, all other remedies remain open to a person injured, such as an action for nuisance or trespass; while in the other case there is a positive statutory authority to do the acts, even though they may involve nuisance or trespass, or anything else which would otherwise be illegal. But, as the Commissioners point out, "the real objection lies deeper." They say: "What it comes to is this—that watching and besetting for the purpose of peaceably persuading is really a contradiction in terms. The truth is that picketing, however conducted, when it consists of watching or besetting the house, &c.—and it is to be observed that the statute places no limit to the number of persons attending for the purpose only of obtaining or communicating information, or to the length of time during which such attendance may be maintained—is always, of necessity, in the nature of annoyance to the person picketed. As such, it must savour of compulsion; and it cannot be doubted that it is because it is found to compel that Trade Unions systematically resort to it. It is obvious how easy it must be to pass from the language of persuasion into that of abuse, and from words of abuse to threats and acts of violence. A considerable proportion of the cases of physical violence which occur during times of strike arises directly or indirectly out of picketing." The Commissioners propose to deal with the question by striking out of the Act of 1875 the enactment about watching and besetting, together with the proviso thereto, and inserting a new paragraph making it illegal to act "in such a manner as to cause a reasonable apprehension in the mind of any person that violence will be used to him or his wife or family, or damage be done to his property." By this means mere watching and besetting would cease to be criminal, while the acts which the Commissioners recognize as the natural outcome of picketing would be distinctly declared to be unlawful.

Clause 2 of the Trades Unions and Trade Disputes Bill provides as follows:—

> An agreement or combination by two or more persons to do or procure to be done any act in contemplation or furtherance of a trade dispute shall not be ground for an action, if such act when committed by one person would not be ground for an action.

Clause 1 of the Government Bill provides—

> The following paragraph shall be added as a new paragraph after the first paragraph of section 3 of the Conspiracy and Protection of Property Act, 1875: "An act done in pursuance of an agreement or combination by two or more persons shall, if done in contemplation or furtherance of a trade dispute, not be actionable unless the act, if done without any such agreement or combination, would be actionable as a tort."

As an instance of the kind of conduct intended to be legalized by these clauses, the Council say reference may be made to the case of *Quinn v. Leathem* (decided by the House of Lords on Aug. 5, 1901), where the decision of the Courts below, by which it had been held that the appellant Quinn and others were liable in damages for certain acts injurious to the business of the respondent Leathem, was upheld. In this case, the law simply stepped in to protect a man, between whom and his workmen there was never at any time any dispute whatever, from being injured by a Trade Union through a third party who also had no quarrel with his workmen.

Clause 3 of the Trades Unions and Trade Disputes Bill provides—

> An action shall not be brought against a Trade Union, or other association aforesaid, for the recovery of damage sustained by any person or persons by reason of the action of a member or members of such Trade Union or other association aforesaid.

Clause 4 of the Government Bill is as follows:—

> (1) Where a Committee of a Trade Union constituted as hereinafter mentioned has been appointed to conduct on behalf of the Union a trade dispute, an action whereby it is sought to charge the funds of the Union with damages in respect of any tortious act committed in contemplation or furtherance of the trade dispute, shall not lie, unless the act was committed by the Committee or by some person acting under their authority: Provided that a person shall not be deemed to have acted under the authority of the Committee if the act was an act or one of a class of acts expressly prohibited by a resolution of the Committee, or the Committee by resolution expressly repudiate the act as soon as it is brought to their knowledge.
>
> (2) The Committee may be a Committee appointed either generally to conduct all trade disputes in which the Union may be involved, or to conduct any trade disputes of a specified class or in a specified locality, or to conduct any particular trade dispute.

The Council point out that these clauses would confer special rights and privileges upon Trade Unions; for these powerfully organized bodies would be enabled to inflict injury upon individuals with impunity, and to commit acts which are, and would continue to be, illegal and punishable when committed by any other class of the community. They note in this connection that Sir Godfrey Lushington, one of the members of the Royal Commission, in a recent letter to "The Times," pointed out that the effect of clause 3 of the Trades Unions and Trade Disputes Bill "is that if a Trade Union dynamites its adversaries or expels them by violence, or burns down a mill or wrecks a train, the funds of the Union—perhaps the very funds by means of which the outrage has been committed—shall be exempt from liability to make reparation; and that, collective liability being thus excluded, and individual liability in the case of workmen being nominal only, Trade Unions shall, so far as civil remedies are concerned, be licensed to commit any wrong whatever."

The Council go on to show that the effect of the law as laid down by the House of Lords in the Taff Vale case is to make a Trade Union or other body liable for acts done by its servants and agents under its authority and for its benefit. They say it is not true, as has been alleged, that any irresponsible member can render the Union liable for any mad or foolish act he may commit. It has been made clear in several recent cases that the law applied to Unions is the ordinary law of principal and agent; and therefore the liability of the Union does not arise unless the express or implied authority of the agent is established. The equity of the law is obvious, and has indeed been admitted by eminent lawyers who support the present Bill.

The Council conclude by pointing out that on the proposed immunity of Trade Union funds the majority of the Royal Commission reported that "no assurance of such immunity has ever been held out; that no public Commission as a body has represented that they ought to be exempt; that no Government has promised that they would be exempt by forthcoming legislation; and that no Judge has pronounced that they are exempt." And the Commissioners are not only clear that there is no legal or historical basis for the Trade Union claim, but they also make the following pronouncement on the question of equity: "That vast and powerful institutions should be permanently licensed to apply the funds they possess to do wrong to others, and by that wrong inflict upon them damage, perhaps to the amount of many thousand pounds, and yet not be liable to make redress out of those funds, would be a state of things opposed to the very idea of law and order and justice." The Commissioners are equally clear as to the good effect of the law as now laid down, and they declare that the evidence is practically unanimous that the effect "has been to make Trade Unions much more careful than heretofore in seeking not to infringe the law; with the result that strikes have been less frequent, that in the conduct of trade disputes there has been less violence and intimidation, and that the disputes themselves have been easier to settle than was the case before the law was authoritatively laid down." The Council think it is obvious

that the enactment of the provisions of clause 4 of the Government Bill would give great scope for fraudulent understandings between a Trade Union and its agents, which, if carried out with sufficient secrecy, could never be established in legal proceedings. Moreover, they would inevitably give rise to a great amount of litigation for the purpose of determining what acts had been authorized or repudiated in any given case.

FATALITY FROM GAS POISONING.

Last Friday, Mr. W. Schröder, the Deputy-Coroner for the Central District of London, held an inquiry into the circumstances attending the deaths of Luigi Assandri (46) and Anna Assandri (44) his wife, who were found suffocated by gas in their bed-room, at a house in Princess Street, Edgware Road, last Tuesday morning. Janie Scarsi, the married daughter of the deceased, stated that her father and mother retired to rest at half-past eleven on the night of the 16th inst. The next morning, about half-past eight, she went up to their bed-room, on the first floor, to call them. Getting no answer, she partly opened the door, and saw her father unconscious upon the bed. A moaning noise was coming from behind the door, which she could not open fully. She at once called her husband. Giuseppe Scarsi, an electrician, the husband of the last witness, said that when he reached the bed-room he found his father-in-law sitting at the head of the bed, apparently unconscious; and there was a strong smell of gas. He fetched two doctors, who told him that life was extinct in the case of Mr. Assandri, but that Mrs. Assandri was still alive. Though there was a gas-pipe in the room, there was no bracket. No one had ever smelt gas in the room; and he did not know that the pipe was connected with the supply. Gas was used for cooking; but witness supplied electricity for lighting from his own storage batteries. As the current failed on Monday, he coupled up the gas-pipe in his own bed-room and in the sitting-room with the meter; and he thought these were the only two rooms connected. On Monday there was an odour of gas, but he could not find any leakage, and thought the smell came from the place where he had connected the pipes. It never occurred to him to go to the deceased's room to see if the leakage was there, because he thought the pipes in that room were not connected with the meter. Dr. Don said he was called at nine o'clock on the morning of the occurrence. When he got into the room he found that the obstruction to the door was caused by Mrs. Assandri, who was lying on her back on the floor. She was living, and he had her removed to another room. The man was sitting up in bed, dead. Subsequent examination of the body showed that death had been gradual, and was due to poisoning by coal gas. Dr. Meerward, who was also called in, said he attended to Mrs. Assandri. He resorted to artificial respiration and administered oxygen, but without effect. She died at half-past ten. A police constable deposed that he discovered gas escaping from an opening in the pipe where in the ordinary way the bracket would be fixed. The pipe was quite close to the head of the bed, and the room was very small. The Jury returned a verdict of "Accidental death" in both cases.

FIRE RISKS OF ELECTRICITY.

Dangers of Short-Circuiting.

At the City Coroner's Court last Wednesday, Dr. F. J. Waldo held an inquiry into the circumstances attending a fire which occurred on the 3rd inst. on the premises occupied by Messrs. Johnston and Co., bookbinders, at No. 38, St. Andrew's Hill, E.C. The building was believed to be about 200 years old; and the interior consisted to a large extent of wood. On the ground floor there was an electric motor by which the machinery in the upper portion of the building was operated. In his opening remarks, the Coroner said the cause of the fire was reported as "unknown;" but it was suspected that the outbreak was due to a defective electric circuit. No fewer than 70 outbreaks last year had been attributed to faulty apparatus. In the City alone, there were a dozen, and a like number in 1904.

After evidence as to the discovery of the fire, Henry Bush, one of the employees of the firm, said that, in accordance with custom, he switched off the electric current before leaving the premises on the night of the fire. During the day, he noticed that there was a high flash in the motor-box. He came to the conclusion that the motor caused the fire, as the burning had been all round it. Mr. Herbert Johnston, a partner in the firm, said the electric motor was installed some four years ago, and everything with regard to its arrangement was left to experts. He believed it had been inspected and approved by the Insurance Companies. The apparatus in the basement had nothing to do with the firm; the current being turned off at the switch on the ground floor. It had never occurred to him that the apparatus in the basement was liable to short-circuiting.

Several Fire Brigade officials expressed the belief that the fire was caused by electricity; one saying he thought there should be some protection round the switch, which was fixed on matchboard. He added that a suspicion existed that a good many fires of late years had been due to short-circuits. Mr. R. Francis Stubbs, an assistant in the Electrical Department of the London County Council, said he was not at all satisfied with the electrical installation; and the fire seemed to him to have been caused by a defect in the cable on the feed side of the switch, which ought to have been fixed on a brick wall. Even if a sheet of asbestos were placed over the matchboard, it would not afford sufficient protection. Questioned as to the high flash of which the first witness spoke, he said all motors were liable to spark; and if, as in this case, they were not attended to regularly by an electrician, they would do so badly. The motor was not at fault nor the switch. The trouble probably arose at the connection of the switch with the cable. He had known of a good many fires which were undoubtedly due to careless workmanship in fitting electric apparatus. In his view, the Board of Trade regulations had not been fully carried out in this case, though there was no actual infringement. In answer to the Coroner, witness said it was possible the fire might have been caused by the throwing down of a light, in view of evidence given by a previous witness to the effect that, though smoking was not allowed on the premises, it was nevertheless indulged in surreptitiously. But he thought his explanation was the right one. Mr. F. W. Moore, an installation inspector of the City of London Electric Lighting Company, Limited, said he thought the fire had not been caused by electric fusion. The switch on the matchboarding was a safe and reasonable arrangement. The Company's regulations—which, however, he would describe rather as suggestions than regulations—had not been complied with. The main fuse was of a good type; and as soon as anything approaching a big current came over the wire, it would blow. The two cables, so far as they were exposed, showed no signs of burning. He had come to the conclusion that the short-circuit occurred inside the tube, and was due to the fact that the rubber insulation on the cables was consumed as a result of the intensity of the fire. A main switch should be fixed near the point of supply.

The Jury found that the cause of the fire was not determined by the evidence, but expressed the opinion that the electric installation was defective, inasmuch as the main switch was not placed sufficiently near the entrance. They recommended that the regulations as to fixing electric apparatus should accord with the suggestions of the Institution of Electrical Engineers.

WATER-WORKS PURCHASE QUESTION AT PORTSMOUTH.

Council Decide to Acquire the Undertaking.

The Portsmouth Town Council, at their meeting last Tuesday, had under consideration the question of acquiring the undertaking of the Water Company. The scheme was fully set out in a report of the Water Committee, which contained the following information and recommendations:—

(1) That the Corporation should hand to each shareholder sufficient 4 per cent. stock to secure to him the full statutory dividend upon his shares. This would require stock to the value of £897,187 10s.

(2) That the debenture stock debt, amounting to £90,487, be paid off at par within a year.

(3) That the terminable debenture debt, amounting to £77,050, be taken over upon the existing terms, and paid off as the debentures mature.

(4) That all debts, liabilities, contracts, pensions, and obligations of the Company be taken over and assumed by the Corporation.

(5) That all the servants of the Company, who may be willing, be taken over by the Corporation, and that a pension to which twelve of them would have been entitled to under the Company be paid at the age of 65.

(6) That £12,757 10s. be paid to the Directors and Auditors as compensation for loss of their fees.

(7) That the present value of the amount owing in back-dividends be paid by the Corporation. This is about £19,133. But against this there is a reserve fund of £17,832, which the Corporation would acquire, and a sum of £500 in the dividends' arrears fund.

(8) From the balance of profit carried over from the half year preceding the transfer of the undertaking, the Directors would reserve the sum of £7000 for payment of winding-up expenses and compensation to servants not included in the pension scheme.

(9) The works must be taken over as they stand, with or without investigation; but it is believed they are in thorough working condition and repair.

(10) It is estimated that the gross profit for one year may be taken at £46,375 1s. 10d. The dividends to stockholders would absorb £35,887 10s., the interest on debenture stock £2714 12s. 2d., the interest on terminable debentures £2527 14s., and the annual instalment for redemption of the stock in eighty years would be £2539 5s.—making a total of £43,669 1s. 2d., and showing a credit balance of £2706 0s. 8d. But a further amount of stock would have to be issued to provide for the payment of the Directors and Auditors, any deficiency on the back-dividends' account, the costs of the Bill, and other incidental expenses.

The adoption of the report was moved by Mr. Pink, who said the Committee were quite unanimous that it would be a great boon to the town for the water undertaking to pass into the hands of the Corporation. They went into the financial question; but on moral grounds they felt that such a transfer was necessary, and practically even if the finances were against them the Committee would still have brought up a report asking the Council to confirm the purchase. Fortunately, the financial aspect of affairs was not so much against them as in 1901. In that year, the Corporation were willing to purchase on terms which would have meant a loss until the year 1917; so that it would have been 1918 before they could have made a profit on the estimate then given. When they entered into the figures for the present proposed purchase, it would be found that the Corporation could carry on the affairs of the Company with hardly any loss; and it would also be found that the Corporation would be enabled in a few years to confer certain advantages, which they had asked the Company to concede for several years, but in vain. He warned the Council, however, that it was useless to expect to make a big profit on the concern—for one reason, that they had to provide a sinking fund. But if they could get this sinking fund for a long term of years, he thought that eventually they would be enabled to make a small profit. The Committee had met the Directors; and they now submitted to the Council the arrangement which they had come to with them. There could be no alteration in the details; for on that the Directors were very firm. But he did not think the Corporation would wish to make any alteration. Of course, the Directors had done their best for the Company, and the Committee had done their best for the town. They could not grumble at the attitude which the Directors had taken up. The proposal, if carried out, would place the shareholders in even a better position than they were at the present time. They would, as the report explained, receive 4 per cent. Corporation stock, and would thus have the security of the whole of the property of the Corporation, and not the security of the Water Company alone. Then £12,757 was to be paid to the Directors by way of compensation. At the present time, £1400 was charged to the balance-sheet every year out of profits; but when the Corporation borrowed the money, the

annual interest and sinking fund would only amount to about half as much. So £700 per annum would be saved at once. The works and plant were in very good condition. The Corporation definitely refused to withdraw their opposition to the Bill for greater powers, as the Directors desired; for by so doing they would have put themselves out of Court at once. The terms were as favourable as the Water Committee could get; but they had tried for even better ones. It was felt that the town would continue to go on progressing for some years; and the purchase could be effected without loss to the Corporation and the shareholders, while the water would be under the complete control of the Corporation. The Corporation should not delay in the matter, for perhaps they would not have such a favourable chance again.

The motion having been seconded, several members supported it. Mr. Corbin, however, raised the question of the shortness of the water supply, as to which the Directors were seeking fresh powers. He thought there should be more particulars on this point, seeing that the Council were asked to commit themselves to such a large expenditure. He therefore moved an amendment referring the report back to the Committee for further information. Other councillors also sought some particulars on various points.

Replying to the questions raised, Mr. Pink said all the officials taken over would receive just and fair treatment; but the Council would not be under any obligation except as to the twelve mentioned. As to the question of deterioration, the Company had told them that they could examine the works, reservoirs, pipes, &c., as much as they liked. They would find them in good order; but even if they were not, the Directors would not allow one penny abatement for deterioration. Dealing with the supply, he said the Directors assured the Committee that for present needs it was sufficient. If the Corporation wished to supplement the supply, they would be in quite as good a position to do so as the Company now were, and probably better. The sources of supply would still be available. As to the continuity of the supply, if it fell short it could be augmented. Even if the present Bill were dropped, no doubt Parliament would assist the Corporation in preventing any other company poaching on the supply. Mr. Bone, the Borough Accountant, had gone through the Company's figures; and he believed those given to be correct. As to the cost of the filtration of the water, it would be something between £20,000 and £30,000. There was a margin of £3000 per annum on the balance-sheet for several years to allow for this.

The discussion was then resumed at considerable length; but eventually the amendment was withdrawn—Mr. Corbin expressing himself as satisfied that there was no need for delay. The motion was then put and carried—42 voting for it, while 3 remained neutral.

SOUTHEND WATER COMPANY TO BUY LEIGH WORKS.

At a Meeting of the Leigh Urban District Council on Wednesday, the 11th inst., there came up for consideration a report dealing with the proposed sale of the Council's water undertaking to the Southend Water-Works Company. This report was presented by a Committee who had been authorized to open up negotiations with the Company, on the basis of a minimum price of £15,000.

The Committee stated that the Company were willing to take over the loan indebtedness of the Council, and relieve them of any future liability in respect thereof, as it might stand at the date of the transfer of the undertaking, or other date agreed upon, and would pay to the Council in cash the difference between the total amount of such outstanding loans and the sum of £14,000; the purchase by the Company to be contingent upon the scales of charges, regulations, and all other obligations upon, and privileges of, the Company being precisely the same as in the remainder of the Company's district of supply. The Council to afford any assistance to the Company which might be necessary to bring this into effect; so that the provision of the Company's Acts might be applicable over the entire area of supply. The cost of obtaining the necessary parliamentary sanction to the transfer would be borne by the Company; but the Council were to afford every assistance in their power, and, if desired, give evidence in support of the application to Parliament. The Company would be prepared, from the date of the provisional agreement, to arrange for an auxiliary supply in case of emergency, provided their own requirements admitted of it, and to afford the Council the benefit of the advice and assistance of their Engineer and Manager when acceptable. It was to be understood, however, that the offer was absolutely final; and that if it should not be accepted, and the Council should incur further expenditure in seeking an additional supply, only to prove abortive, the Company, in the event of negotiations being re-opened, would not on any account take any such expenditure into consideration. The Committee unanimously recommended the acceptance of the Company's terms, upon carefully reviewing the whole of the circumstances connected with the concern, and taking into consideration, *inter alia*: (*a*) The present loan indebtedness of the Council, amounting to £12,776; (*b*) the deficiency in the receipts, which has been a burden on the rates ever since the formation of the Council, amounting in the aggregate to £4208, or an average of £526 a year; (*c*) the absolute necessity of a constant supply to meet the growing needs of the district; (*d*) the generally-admitted shrinkage of water for some years past over the whole of south-east Essex; (*e*) the view expressed in Mr. Bryan's report as to the purely speculative character of any new borings; and (*f*) the great expense of carrying out either of the schemes suggested to the Council without (even if a further supply of water should be found) any appreciable increase in the revenue, for some years at any rate.

The adoption of the report was moved by Mr. Savage, who remarked that the total expenditure on the undertaking had been about £15,686; and the amount allowed for depreciation (£1000) was a very small one —6½ per cent. Therefore, in receiving £14,000 for the concern, they were getting a very fair price. He did not see how they could improve the undertaking under present circumstances without raising the price of water, for which they would have to get powers. They had three separate schemes before them for obtaining water—one for boring near the present well, and two for boring near the shore. Mr. Bryan had said in his report that the problem of obtaining water was a most difficult one. There had been a general shrinkage of water all over the district; and boring would be purely speculative. Even if they found water, they would be put to the expense of duplicating their machinery and increasing the staff. By selling the undertaking, all this would be got over; and in about twelve months they would be connected with Southend and have a constant supply.

An amendment that the matter be adjourned by the Council until after a poll of the ratepayers had been taken, was defeated; and the report was then adopted by eight votes to two.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 220.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Apl 11	10½	Alliance & Dublin 10 p.c.	21—22*	..	4 15 5
160,000	10	,,	7½	Do. 7 p.c.	14½—15½*	..	4 16 9
200,000	5	Nov. 15	7	Bombay, Ltd.. . . .	6¾—7¼	..	4 16 7
40,000	5	..	7	Do. New, £4 paid	4¾—5¼	..	5 6 8
50,000	10	Mch. 9	14	Bourne- } 10 p.c. . .	28½—29½	..	4 14 11
51,810	10	,,	7	mouth Gas } B 7 p.c. .	16½—17½	..	4 0 0
53,200	10	,,	6	and Water } Pref. 6 p.c.	15—16	..	3 15 0
380,000	Stk.	Feb. 22	12½	Brentford Consolidated	263—268	..	4 13 3
300,000	,,	,,	9½	Do. New . . .	197—202	..	4 14 1
50,000	,,	,,	5	Do. 5 p.c. Pref. .	123—128	..	3 10 11
206,250	,,	Dec. 14	4	Do. 4 p.c. Deb. .	105—108	..	3 14 1
220,000	Stk.	Mch. 9	11½	Brighton & Hove Orig.	230—235	..	4 15 9
246,320	,,	,,	8½	Do. A. Ord. Stk. .	163—168	..	4 18 3
460,000	20	Apl 11	10	British	42½—43½*	..	4 11 11
100,000	Stk.	Feb 22	6	Bromley, Ord. 5 p.c. .	121—124	..	4 16 9
165,700	,,	,,	4½	Do. do. 3½ p.c. .	92—95	..	4 14 9
500,000	10	Oct. 13	7	Buenos Ayres (New) Ltd.	12¾—13¼	..	5 5 8
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb. .	97—99	..	4 0 10
150,000	20	Mch. 9	8½	Cagliari, Ltd.	23—25	..	6 12 0
100,000	10	Sept. 28	10	Cape Town & Dis., Ltd.	17—17½	..	5 14 3
100,000	10	Oct. 27	4½	Do. 4½ p c Pref.. .	10—10½	..	4 5 9
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
50,000	Stk.	Dec. 29	4½	Do. 4½ p.c. Deb. Stk.	100—102	..	4 8 3
1,443,280	Stk.	Feb. 22	5 5/16	Commercial 4 p.c Stk. .	114—116	..	4 9 7
560,000	,,	,,	5	Do. 3½ p.c. do. .	111—113	..	4 8 6
475,000	,,	Dec. 14	3	Do. 3 p.c. Deb. Stk.	85—87	..	3 9 0
800,000	Stk.	,,	6½	Continental Union, Ltd.	129—132	..	4 18 6
200,000	,,	,,	7	Do. 7 p c Pref.	143—148	..	4 14 7
432,070	Stk.	Feb.	5½	Derby Con. Stk. . . .	122—124	..	4 8 9
55,000	,,	Jan.	4	Do. Deb. Stk. . . .	105—107	..	3 14 9
486,090	10	jan. 25	11	European, Ltd. . . .	23—24	..	4 11 8
354,060	10	,,	11	Do. £7 10s. paid	17—18	..	4 11 8
15,223,235	Stk.	Feb. 8	4 5/16	Gas- } 4 p.c. Ord. . .	98—99	..	4 8 11
2,600,000	,,	,,	3½	light } 3½ p.c. max. .	88—90	..	3 17 9
3,799,735	,,	,,	4	and } 4 p.c. Con. Pref.	109—111	..	3 12 1
4,193,975	,,	Dec. 14	3	Coke } 3 p.c. Con. Deb.	88—90	..	3 6 8
258,740	Stk.	Mch. 9	5	Hastings & St. L. 3½ p.c.	98—102	..	4 18 0
82,500	,,	,,	6½	Do. do. 5 p.c.	121—124	..	5 4 10
70,000	10	Apl 11	11	Hongkong & China, Ltd.	19½—20½*	.	5 7 4
3,800,000	Stk.	Nov. 15	10	Imperial Continental .	236—238	+	4 4 0
473,600	Stk.	Feb. 8	3½	Do. 3½ p.c. Deb. Red.	96—98	..	3 11 5
175,242	Stk.	Mch. 28	6	Lea Bridge Ord. 5 p.c. .	121—126	..	4 15 3
561,000	Stk.	Feb. 22	10	Liverpool United A . .	235—237	..	4 4 5
710,100	Stk.	Feb. 22	7	Liverpool United B .	169—171	+1	4 1 10
306,083	,,	Dec. 29	4	L'rpool Unit'd Deb. Stk.	109—111	..	3 12 1
75,000	5	Dec. 14	5	Malta & Medn., Ltd. .	4¼—4¾	..	5 5 3
560,000	100	Apl. 2	5	Met. of } 5 p.c. Deb..	101—103	..	4 17 1
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	Nov. 15	3½	Monte Video, Ltd. . .	11½—12½	..	5 12 0
1,675,892	Stk.	Feb. 22	4½	Newc'tle & G'tesh'd Con.	108—110	+1	4 4 1
406,025	Stk.	Dec. 29	3½	Do. 3½ p.c. Deb.	98—100	..	3 10 0
15,000	10	Mch. 9	10	North Middlesex 10 p.c.	19—20	..	5 0 0
52,940	11	,,	7	Do. 7 p.c.	12½—13½	..	5 3 8
300,000	Stk.	Nov. 30	8	Oriental, Ltd. . . .	150—153	..	5 4 7
600,000	5	Mch. 28	7	Ottoman, Ltd. . . .	6—6½	..	5 7 8
398,490	5	Apl. 28	7†	Primitiva Ord. . . .	7—7½	..	4 13 4
796,980	5	Jan. 25	5	Do. 5 p.c. Pref. .	5¼—5½	..	4 10 11
488,900	100	Dec. 1	4	Do. 4 p.c. Deb. .	98—100	..	4 0 0
851,070	10	Oct. 13	7	River Plate Ord. . . .	13½—14	..	5 0 0
300,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb. .	98—100	..	4 0 0
250,000	10	Mch. 28	8	San Paulo, Ltd. . . .	14—14½	..	5 8 0
70,000	50	Jan. 2	5	Do. 5 p.c. Deb. .	50—52	..	4 16 2
135,000	Stk.	Mch. 28	10	Sheffield A	244—246	..	4 1 4
209,984	,,	,,	10	Do. B	243—245	..	4 1 8
523,498	,,	,,	10	Do. C	243—245	..	4 1 8
126,106	Stk.	Mch. 9	5½	Shrewsbury Ord. 5 p.c.	108—118	..	4 13 3
70,000	10	Sept. 28	10	South African	16½—17½	..	5 14 3
6,250,000	Stk.	Feb. 22	5½	South Met., 4 p.c. Ord.	127—129	..	4 5 3
1,895,445	,,	Jan. 11	3	Do. 3 p.c. Deb.	88—90	..	3 6 8
575,000	Stk.	Mch. 9	5½	S'th Suburb'n Ord. 5 p.c.	120—123	..	4 9 5
60,000	,,	,,	5	Do. 5 p.c. Pref. .	125—130	..	3 16 11
112,533	,,	Jan. 11	5	Do. 5 p.c. Deb. Stk.	132—137	..	3 13 0
502,310	Stk.	Nov. 15	5	Southampton Ord. . .	109—112	..	4 9 3
120,000	Stk.	Mch. 9	6¼	Tottenham } A 5 p.c. .	124— 27	..	4 18 5
363,020	,,	,,	4¼	and } B 3½ p.c. .	99—102	..	4 13 2
137,500	,,	Dec. 14	4	Edmonton } 4 p.c. Deb.	105—107	..	3 14 9
182,380	10	Dec. 29	8	Tuscan, Ltd.	10¼—10¾	..	7 8 10
149,900	10	an. 2	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
30,000	Stk.	Feb. 22	7½	Wands- } A 5 p.c. . .	—	..	—
255,636	,,	,,	6¼	worth } B 3½ p.c. . .	133—136	..	4 11 11
75,000	,,	,,	5 5/16	and } C 3½ p.c. . .	110—113	..	4 16 0
69,416	,,	Dec. 29	3	Putney } 3 p.c. Deb. Stk.	82—85	..	3 10 7
745,872	,,	Mch 9	5½	West Ham 5 p.c. Ord. .	107—109	..	4 14 0
185,000	,,	,,	5	Do. 5 p.c. Pref. . .	122—125	..	4 0 0
193,300	,,	Dec. 29	4	Do. 4 p.c. Deb. Stk.	106—109	..	3 13 5

Prices marked * are "Ex. div." † Next dividend will be at this rate.

SHREWSBURY NEW WATER SCHEME.

The Proposal Explained to the Ratepayers.

The water scheme for authority to carry out which a Bill is now being promoted in Parliament by the Shrewsbury Corporation, was explained by the Mayor (Mr. R. E. Jones) at a very largely attended town's meeting held a fortnight ago. A good deal of opposition was manifested to the proposals; but, on a show of hands, the resolution in favour of the Bill was declared carried. Subsequently a poll was demanded, on a requisition signed by about 150 ratepayers. It may be remarked that the present upland scheme was only decided upon in preference to a river supply after the ratepayers had, on a poll, expressed themselves in favour of it.

The Mayor explained that the proposal consisted in making a reservoir at Pulverbatch to hold 315 million gallons, and intercepting the water from 1873 acres of the uplands, and diverting it into the reservoir. The quantity of water obtained by the scheme would be sufficient to supply the needs of a population of 35,000 persons, at 30 gallons per head per day. This would be available for the town after the usual compensation water had been given to the stream. The water would be soft in character; and, when filtered, it would prove to be a supply excellently adapted for domestic and manufacturing purposes. In order to secure the absence of pollution on the watershed, it was proposed to buy the whole of the 1873 acres from which the water would be obtained. The use of those parts of the land which were farmed would be continued for agricultural purposes; but this would be done under regulations as to manuring and the disposal of the farm waste and refuse which would prevent pollution. The amount of the estimate for the works and for the lands on which the works themselves would be situate was £148,000. In addition, there was the remainder of the watershed, which it was estimated would cost £35,000. In the event of the Bill receiving the sanction of Parliament, the Engineer intended to suggest to the Corporation, as a matter of additional precaution—seeing that the financial question was an important one—that, before embarking on any of the heavy expenditure for the works, the trench for the embankment at Pulverbatch should be opened. This would inform them fully as to the nature of the strata, and would reveal the difficulties (if any) to be encountered. So far as the Engineer could form an opinion from the data at present available, there was no risk in the trench; but should unforeseen troubles arise, the Corporation would not be committed to a vast expenditure before the difficulties were determined. The views of the Local Government Board on the subject could be gathered from the following extract from a letter written by them to the Town Clerk: "The Board trust that the Town Council will use every endeavour to press forward the Bill during the session of 1906, so that a satisfactory supply of water for the borough may be obtained at the earliest practicable date."

When afterwards addressing the meeting, Mr. G. R. Strachan, the Engineer to the Corporation, said there were only three points he need refer to. The first was to state that under the scheme it was first proposed to dig a trench in the Pulverbatch Valley; and if it was then found that the place was unsuitable, it would be unnecessary to proceed further with the scheme. The second question was a financial one; and having had ample opportunities of going through the estimate, the one submitted of £148,000, he conscientiously said, might be relied on. His third point was as to whether there was water enough there; and he said there was. He believed the scheme to be a sound project, and one well worthy the town.

The Chairman of the Water Committee (Alderman Morris) put forward figures which showed that the adoption of the scheme would not entail an increase of more than 2d. or 3d. in the rates. He said he had for many years carefully studied the question, and was perfectly satisfied that it was the best scheme they could have, and that if carried out it would tend to promote the prosperity of the town.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The task which the members of the Waverley Association of Gas Managers set themselves at their half-yearly meeting at Peebles on Friday last was that of setting their house in order. Technical subjects were laid aside for the time, and a discussion upon fiscal questions took their place. A Committee has been appointed to take the opinion of the members upon the subject of setting up a constitution for the Association, under which considerable changes in practice will be authorized. Hitherto the Association have not had a constitution, nor any funds, but have carried on their business free from the restraints of regulation; and each meeting, before separating, subscribed to defray their own charges. Now it is proposed to have a Committee and an annual subscription, which will require some written rule for its administration. It is further proposed to meet annually instead of half yearly. The principal reason for the proposed changes is that there are so many Associations now that attendances are falling off. In other words, the Waverley Association are feeling the pinch of competition; and the suggestion is that the competition may be overcome by offering less resistance to it. It may be that the policy is, in the circumstances, the best which could be adopted. The Association was formed forty-five years ago, when gas managers worked more by rule-of-thumb than they do now, and did so for the reason that opportunities for training them did not exist as they do now. The aim of association in the early days was more mutual assistance in common troubles than the prosecution of systematic study. We have all travelled a long way from that state of matters. With the younger race of gas managers particularly, the great object is to understand everything both within and without a

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
Blackburn	1,250,000	Buffalo, N.Y.	2,000,000	Newcastle-on-Tyne	1,800,000
Windsor St. Works, Birmingham	2,000,000	Winnipeg, Man.	500,000	Leeds	1,800,000
Saltley Works, Birmingham	2,000,000	Colchester (Second Contract)	300,000	Malton	150,000
Colchester	300,000	York	750,000	Smethwick	500,000
Birkenhead	2,250,000	Rochester	500,000	Gravesend	300,000
Swindon (New Swindon Gas Co.)	120,000	Kingston, Ont.	300,000	Pernambuco, Brazil	125,000
Saltley, Birmingham (Second Contract)	2,000,000	Crystal Palace District	2,000,000	Duluth, (Second Contract)	300,000
Windsor St., Birmingham (Second Contract)	2,000,000	Duluth, Minn.	300,000	Leicester (Second Contract)	1,000,000
Halifax	1,000,000	Caterham	150,000	Newport (Second Conttract)	250,000
Toronto	250,000	Leicester	2,000,000	Brockville	250,000
Ottawa	250,000	Enschede, Holland	150,000	Toronto (Third Contract)	750,000
Lindsay (Remodelled)	125,000	Buenos Ayres (River Plate Co.)	700,000	Montreal, Ont. (Second Con.)	1,800,000
Montreal	500,000	Burnley	1,500,000	Toronto (Fourth Contract)	1,000,000
Toronto (2nd Cont., Remodelled)	2,000,000	Kingston-on-Thames	1,750,000	Hamilton, Ont.	400,000
Belleville	250,000	Accrington	500,000	Rochester (Third Contract)	1,600,000
Ottawa (Second Contract)	250,000	Tonbridge	300,000	Leeds (Second Contract)	900,000
Brantford (Remodelled)	200,000	Stretford	500,000	Buenos Ayres (Primitiva Co.)	1,200,000
St. Catherines (Remodelled)	250,000	Oldbury	300,000	Buenos Ayres (New Co.)	1,200,000
Kingston, Pa.	125,000	Todmorden	500,000	Christchurch, N.Z.	300,000
Peterborough, Ont.	250,000	Saltley, Birmingham (Third Contract)	2,000,000	Rochdale	1,600,000
Wilkesbarre, Pa.	750,000	York (Second Contract)	750,000	St. John's, Newfoundland	250,000
St. Catherines (Second Cont.)	250,000	Rochester (Second Contract)	500,000	Brantford (Second Contract)	400,000
		Newport (Mon.)	250,000	Smethwick (Second Contract)	500,000
		Tokio, Japan	1,000,000	Pontypridd	250,000
				Montreal (Third Contract)	1,800,000

And, in addition, COAL GAS PLANTS at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

gas-works. The body which seeks to educate its members will receive support; the body which does not will receive no acquisitions to its membership, and will dwindle away. Now, the Waverley has been more of a neighbourly than an academic body. They have not modernized their methods, and other bodies have sprung up, with ways of carrying on work which appeal more to the present-day aspirants for honours in the gas world than do the ways of their fathers. The proposal of the Waverley Association is that they shall remain as they have been, not themselves taking up the advanced position, and that they will not only not seek to prevent others advancing, but they will positively assist them by restricting their own field of operations. The question which the members have to consider is a momentous one for the Association. If they adopt the policy of giving way, they may be taking a step which cannot be recalled; if they decide upon modernizing their organization, they may find that they are too late, having already been supplanted. There is, therefore, every reason why the members should consider carefully how they are to answer the queries which are to be submitted to them. There is, and can be, no question of allowing the Waverley Association to become extinct. Holding the position it does, it must be kept alive—the more so the better; and in the great question they have now to decide, it might not be impolitic, seeing that outsiders have an interest (sentimental, it is true) in the fortunes of the Association, that advice should be sought from well-wishers outside of their own ranks.

At the monthly meeting of the Grangemouth Town Council, the Clerk submitted a draft of the agreement between the Council and the Grangemouth Gas Company, relative to the transfer of the Company's undertaking to the Corporation. The draft was gone over, and various amendments were made upon it. It was resolved to send it to Mr. J. M'Gilchrist, of Dumbarton, the Council's adviser in the matter, for his revisal, and, if he approved, to return the document to the Company for extension. It was agreed to inform the Gas Company that the Council did not desire them to fix coal contracts, but to arrange to have sufficient coal in stock at the date of the transfer to meet requirements for one month thereafter. The Council considered the subject of the financial arrangements to be made for paying the price of the undertaking on May 16; and having heard the Burgh Chamberlain as to the probability of the shareholders of the Gas Company being willing to lend money, they instructed him to ascertain to what extent it was likely the shareholders would allow their money to remain on loan at 3½ per cent. interest.

A meeting under the auspices of the Carluke Merchants' Association was held last week, to consider the question of the price charged for gas by the Gas Company, which is at the present time 3s. 1½d. per 1000 cubic feet, with 10 per cent. discount to all consumers of 25,000 cubic feet per quarter. In the discussion, complaint was, of course, made regarding the quality of the gas. It was unanimously agreed to send a petition to the Directors of the Company, asking a reduction in price.

The Forfar Town Council on Wednesday entered into contracts for 3600 tons of coal at an average price of 16s. 3d. per ton, the same as last year.

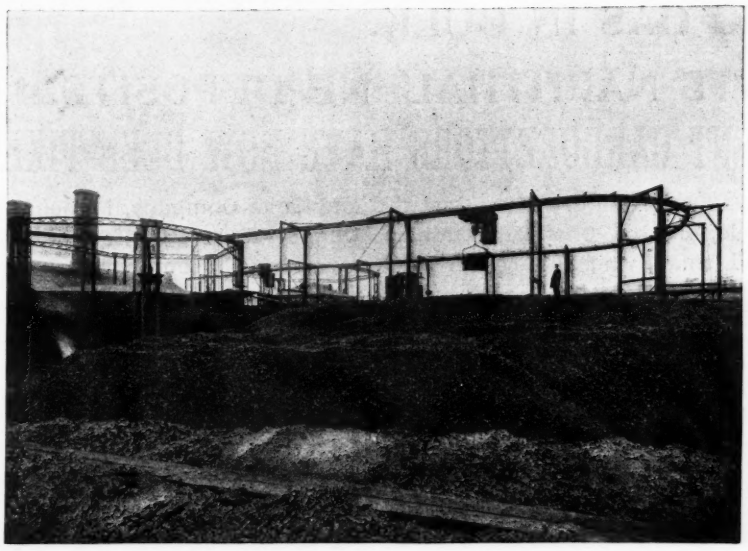
The Wishaw Town Council on Monday of this week accepted a tender for the laying of a new gas-main from the works to the burgh boundary at Flemington. The work will entail an expenditure of about £3000.

The subject of this paragraph is perhaps outside the domain of the "Notes" column; but I write it with a purpose. It is the important scheme for the erection of an entire town which is being carried out by Messrs. R. M'Alpine and Sons, the great firm of contractors in Glasgow. In the course of the construction of a railway in the neighbourhood, the firm found a huge bed of fine clay, which they resolved to make into bricks, and therewith to build a model town, on the Garden City principle. Accommodation is being provided for 20,000 persons. I do not go further into the subject than to say that the site is on the Duntocher Hills, in the neighbourhood of Dalmuir, in Dumbartonshire; and the purpose I have in view is to suggest to whoever has the interest, if anyone has, that the lighting of this model town is worth looking after. The Corporation of Glasgow have power to supply gas in Dalmuir, and this place may be within their area. If it is not, I fear no one else has any right in the district.

The Water Committee of the Dundee Town Council are considering schemes which will involve an expenditure of about £44,000. The most important item is a proposal to relay the water-main which was first put down for the bringing in of the water of Lintrathen Loch, for a distance of four miles in the valley of Strathmore. This main has all along been very unsatisfactory; serious bursts in it having been frequent till a second main was laid, which enabled it to be worked at lower pressure. Mr. Baxter, the Water Engineer, estimates the cost of relaying at £17,500; and he reports that when the work is effected, the carrying capacity will be increased from 12 to 14 million gallons per day. Another item under consideration is the construction of clear-water wells at Mains of Panmure and Gagie, at an estimated cost of £15,000. There is also the taking over of the water-works belonging to the burgh of Carnoustie, which has been agreed to; the price being over £11,000.

Silsdon Gas Supply.—The second annual report of the Silsdon Urban District Council on the working of the gas undertaking shows that favourable progress is being made. The plant is equal to the production of 12 million cubic feet of gas per annum, and the make last year was 11½ millions, from 1160 tons of coal. The leakage was 9·4 per cent., against 12·57 per cent. the preceding year, but when the town received gas from the Kildwick Gas Company it was 20 per cent. Since the Council undertook the supply of gas, there has been an increase of 169 consumers. The profit for the year ended the 31st of March last was £480; and £322 interest on loans, and principal amounting to £285 have been paid. It has been decided to reduce the price of gas from 3s. 9d. to 3s. 4d. per 1000 cubic feet.

TEMPERLEY TRANSPORTERS



Temperley Transporter Plant for Storing Coke at the Paisley Corporation Gas-Works. The same plant is used for screening and loading into delivery carts.

For the

RAPID AND ECONOMICAL

HANDLING OF COAL & COKE

AT

Gas - Works, Electricity Generating Stations, &c.,

BY MEANS OF GRABS OR PATENT AUTOMATIC DUMPING BUCKETS.

Temperley Transporter Co.

72, Bishopsgate Street Within,

LONDON, E.C.

Telephone: 365 LONDON WALL.
Telegrams: TRANSUMO, LONDON.

NO BREAKAGE OF COKE if you use Temperley Transporters.

CURRENT SALES OF GAS PRODUCTS.

Week ending April 21.

There has been little business done during the past week in London tar products. The outlook for pitch continues to improve; and inasmuch as coal briquettes and freights have all advanced, it is safe to predict that the value of pitch will rise too. Therefore makers who are well sold for the present are cautious as to undertaking future engagements, and for delivery in the next half year they quote 32s. net, although, of course, this figure is not yet obtainable. There is a good inquiry for 60's crude carbolic acid, both for prompt and forward shipment. Ordinary London creosote is in a strong position; the principal holders requiring fully 2d. net in bulk. In sulphate of ammonia there has only been a limited business done; and the price obtained was a little below the nominal value. The quotation, on Beckton terms, is £12 10s. net nominally.

Sulphate of Ammonia. LIVERPOOL, *April* 21.

The business of the week has to a certain extent been interfered with by holidays, but the market does not appear to have been appreciably affected. Current production, which at this season from gas-works is a declining quantity, continues to be absorbed, but the extra demand required to bring about a recovery in values is wanting. The closing quotations are £12 3s. 9d. per ton f.o.b. Hull, £12 6s. 3d. per ton f.o.b. Liverpool, and £12 7s. 6d. per ton f.o.b. Leith. Exports from Scotland to the end of March show a substantial falling off compared with those for January-March, 1905, but this has been balanced by extra demand for home consumption. In England, too, there has been increased home demand. There has been no change in the forward position, makers and buyers still holding tenaciously to their divergent views.

Nitrate of Soda.

Though spot demand has only been moderate, prices are maintained at 11s. 6d. per cwt. for 95 per cent., and 11s. 9d. per cwt. for refined quality.

Tar Products. LONDON, *April* 21.

Owing to the Easter holidays, there has been scarcely any business of importance doing during the past week. In pitch, London makers still ask very high prices, which render business quite impossible; but dealers are evidently willing to accept considerably under manufacturers' ideas. There is not so much demand for prompt delivery, doubtless owing to the labour troubles in the North of France, which will probably prevent briquette manufacturers from taking delivery just at present. Sales are reported to Belgium of best Yorkshire pitch for September-December delivery at fairly good price; but in Liverpool, there is really no demand for early shipment. Nearly all the inquiries at the moment appear to be for January-June next year, for which period South Wales consumers would undoubtedly be buyers. Makers, however, do not care to sell so far forward in the present uncertain state of the market. There is really very little doing in benzol; but small quantities of special quality are being sold for gas enriching at fairly good prices. In solvent, the market is scarcely so firm, and makers appear rather more desirous of selling, especially forward, though so far as actual London makes are concerned the position remains unchanged. There is no change to report in carbolic acid. Sellers still ask 1s. 9¾d. to 1s. 10d. for prompt and forward delivery; but consumers are not prepared to pay more than 1s. 9½d., at which price they report that they are still securing supplies. Prices are unchanged in creosote. There is very little offering in London; while Yorkshire makers still maintain their price, and have declined sales forward at a slight reduction upon existing prices. In Toluol, there is really nothing offering for either prompt or forward delivery. Neither consumers nor manufacturers appear to take any interest in anthracene just at present, and prices seem purely nominal.

The average values during the week were: Tar, 16s. to 21s. Pitch, London, 27s. 6d. to 28s.; east coast, 26s. 6d. to 27s.; west coast, 24s. 6d. to 25s. Benzol, 90 per cent., 9¼d. to 9⅜d.; 50-90 per cent., 10¼d. to 10⅜d. Toluol, 1s. 0⅜d. to 1s. 1d. Crude naphtha, 4d. to 4⅛d.; solvent naphtha, 1s. to 1s. 0½d.; heavy naphtha, 11d. to 11½d. Creosote, London, 1⅜d.; North, $1\frac{7}{16}$d. to 1½d. Heavy oils, 2¼d. Carbolic acid, 60 per cent., 1s. 9½d. to 1s. 10d. Refined naphthalene, £4 10s. to £8 10s.; salts, 19s. to 20s. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

Markets have been very quiet during the past week, and close rather weaker; but there is little or no business doing, as buyers are not prepared to pay prices asked by manufacturers. Beckton now quote £12 10s.; but dealers are prepared to accept a lower price on Beckton terms. In Hull, the market is very quiet, and £12 3s. 9d. is reported to have been accepted for early shipment. In Leith, there are sellers at £12 7s. 6d.; but buyers at present will not pay this price for early delivery. There is very little business doing in Liverpool. Sales are reported at £12 3s. 9d. to £12 5s., while one or two parcels of inferior quality are believed to have changed hands at £12 2s. 6d.

Water Supply Needed at Felsted.—It has been intimated to the Dunmow Rural District Council that, unless the Local Government Board receive an assurance before the end of this month of "instant and full obedience" to an order requiring a proper water supply for Felsted, an application will be made in the High Court for a writ of *mandamus*. The Council, on the other hand, are wishful to defer matters, so as to formulate a scheme for several parishes.

THE

MAXIM PATENT CARBURETTOR

FOR ENRICHING GAS IN BULK.

PREVENTS NAPHTHALENE DEPOSITS.

OVER **120** MAXIM PATENT CARBURETTORS HAVE NOW BEEN FIXED.

Among the Companies and Towns supplied are The Gaslight and Coke Company, Manchester, Exeter, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Oldham, Dundee, Perth, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past **Ten Years.**

MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.

THE ENRICHMENT IS INSTANTANEOUS AND PERMANENT.

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.

For Prices and full Particulars, apply to

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

7, BISHOPSGATE STREET WITHOUT, LONDON, E.C.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The coal pits of the county are now fully at work after the Easter Holidays. The recent rise of 5d. per ton for all kinds of steam coal has become general, and is cheerfully paid. It will be well if there is not another increase before the summer is over. Contractors at present prices are lucky; for the demand for this class of fuel is certain to become much stronger than it is at the moment, owing to the enormous growth of new cotton mills and weaving sheds. The prevalence of cold east winds of late has prevented the reduction in the consumption of house coal which had been expected with the advent of fine weather, and prices remain firm. Cannel and gas coal show a slight falling off in quantity used, but no alteration in terms.

Northern Coal Trade.

The coal trade has shown the activity that is usual after the lessening of stocks by the holidays, and when the demand from the northern ports is just commencing in earnest. In the steam coal trade, the demand is full; but less is being sent to the strike regions of France. Best Northumbrian steams are 11s. to 12s. per ton f.o.b., according to period of delivery, and second-class steams are relatively high at from 10s. 9d. to 11s. Steam smalls continue scarce, and from 6s. 6d. to 7s. per ton f.o.b. is quoted, despite the fact that these prices would carry the tax. The collieries are now working well, and the output is heavy. In the gas coal trade the demand is good and high prices are asked, though not as readily conceded. Some sales for export have been made of best Durham gas coals at 10s. to 10s. 3d. per ton f.o.b. A few cargoes of gas coals are still being sent to some of the French ports, but less than was the case three weeks or so ago; and, in the meantime, there is a reduced shipment to the home ports, though that to the Baltic is now commencing in earnest—so that all round the gas coal output is well taken up, and prices for occasional cargoes vary from about 9s. 6d. to 10s. 4½d. per ton f.o.b. according to quality. There is little to add to what was said last week as to the large contracts—they are slowly being completed, and this at the advanced prices that have been pointed to by previous contracts. In coke, the demand is fair; and gas coke is a little firmer as the production is reduced. On Tyneside, from 10s. 3d. to 10s. 9d. per ton f.o.b. is quoted for good gas coke.

Scotch Coal Trade.

The volume of business continues to augment; all classes being in demand. Prices, however, are not being correspondingly affected—in fact, in this respect the market may be said to be quiet in the meantime. The quotations are: Main 7s. 9d. to 8s. per ton f.o.b. Glasgow, ell 9s. 3d. to 10s. 3d., and splint 9s. 3d. to 9s. 6d. The shipments for the week amounted to 313,830 tons—an increase of 45,359 tons upon the preceding week, and of 92,366 tons upon the same week of last year. For the year to date, the total shipments have been 3,568,781 tons—an increase of 397,193 tons upon the corresponding period of 1905.

Gas Supply in Bombay.

The accounts to be presented at the meeting of the Bombay Gas Company, Limited, on the 3rd prox., show that the revenue from the supply of gas to private consumers amounted last year to £25,065; and that the public lighting produced £13,247—making together £38,312. Meter and fittings rents yielded £1308; the sale of coke and tar, £9631; and the other receipts made up a total of £50,358. The expenditure on coal was £15,454; the manufacture and distribution of gas cost £13,254; and other items brought up the expenses to £34,353—leaving a balance of £16,005. Adding the amount carried forward from 1904 (£4158), there is a total of £20,163 available for distribution. The interim dividend paid in December last absorbed £8400 of this sum; and the Directors now recommend a dividend of 3½ per cent., free of income-tax—making 7 per cent. for the year—which will leave £3363. For the preceding five years, the dividend has been at the rate of 6½ per cent. Reviewing the work of the year, the Directors remark that the new contract for lighting the public lamps for ten years came into operation as from the 1st of July. There was a slight increase in the sale of gas; but owing to the reduction in price, both to private consumers and for the public lamps, the rental necessarily diminished. The cost of coal carbonized was £1290 more; but the receipts from residuals were increased by £999. In view of the reduction in price, the Directors consider the results of the year's working satisfactory, and justify the policy pursued.

Church Lighting by Incandescent Burners.—The parish church of St. Nicholas, Kenilworth, has recently been relighted by inverted incandescent gas-burners with "Ecliptic" fittings. The work has been carried out by the Nuneaton Gas Company, under the supervision of their Engineer and Manager (Mr. George Helps); and we are informed that the improvement in the light is very noticeable, and is giving much satisfaction. At the Vestry meeting of St. John's, Stockton, last Tuesday, it was announced that since the introduction of incandescent gas-burners the expenses for lighting the church had been reduced from £30 to about £6 per annum.

Public Lighting Ideas at Dolgelly.—Visitors to Dolgelly on Easter Monday must have been somewhat surprised to find that, when evening came on, the town (so far as public lighting was concerned) was allowed to remain in darkness. Mr. Fox, a new member of the Urban District Council, has also expressed his amazement at such a condition of affairs—remarking that "it was an absurdity that the assize town of Merioneth should be in total darkness at this time of the year." Dr. Jones, another councillor, inquired of the Clerk why this was the case; and the reply was that it was because the contract with the Gas Company expired the previous day. It was thereupon resolved to make arrangements for the further lighting of the town. It may be pointed out that the desirability of adopting a scheme of electric lighting for the district has been under consideration.

JUST THINK OF IT!

HOT WATER ALWAYS ON TAP

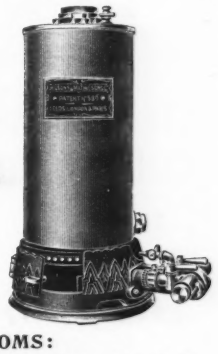
WITHOUT THE KITCHENER FIRE,

BY THE

WILSON

GAS CIRCULATOR WATER-HEATER

FIXED TO EXISTING PIPES.



15 Gallons of Hot Water for One Penny.

PLEASE WRITE FOR FURTHER PARTICULARS.

WILSONS & MATHIESONS, LTD.,
Carlton Works, Armley, LEEDS.

LONDON SHOW-ROOMS:
76, Queen Street, Cheapside, E.C.

Costs of the Torpoint Water Bill.

It was announced at Torpoint last week that the Admiralty had agreed to pay £5000 towards the costs of the Water Bill which the District Council promoted last year, but failed to get parliamentary sanction for. It may be remembered that one of the reasons which led the Council to embark upon the scheme embodied in the Bill was an intimation that the Admiralty intended to erect a large building in the district for use as a gunnery school. This intention was, however, abandoned while the project was under consideration in Committee; and as the Council received no direct support from the Admiralty, and were strongly opposed by the owner of the water which it was proposed to appropriate, the Bill was rejected. The total costs amounted to £5771. The Government was pledged to pay 10-26ths of the costs; but the balance threatened to impose an overwhelming burden on the ratepayers of the small district. In these circumstances, the matter was taken up by the Member of Parliament for the division (the Hon. T. C. R. Agar-Robartes), with the result that the Admiralty agreed to pay £5000. Much gratification with this result was expressed at a meeting of the District Council on Thursday; and a vote of thanks was passed to Mr. Agar-Robartes for his services in the matter. The Chairman (Mr. A. F. Holman) hinted at the possibility of a contribution from another source towards the balance of the costs; but he said that in any case it would be necessary for the Council to take steps to provide the town with a more adequate supply of water.

Teignmouth Water Supply.—Complaint was made at a meeting of the Teignmouth District Council last week that the Local Government Board had not yet given their sanction to the scheme put forward by the Council for obtaining a supply of water for the new works which the Paignton District Council are constructing on Dartmoor. The Clerk explained that the Board had sent down a copy of the draft Order, which he had amended and returned. A similar course had, no doubt, been taken with reference to the objectors to the scheme; and until they returned their copies of the draft, the Board would not issue the Order to enable the Council to lay mains outside their district. Mr. Slocombe said the inquiry was held five months ago, and the delay was unreasonable. Even after the Order was received, it would take eighteen months to carry out the work; and it would be 1908 before they got the water. The delay was a very serious thing for the town; and he moved that the Local Government Board be informed that if the matter was not quickly settled they would have to get the Member of Parliament for the division to put a question on the subject in the House of Commons. Other members of the Council joined in the complaint as to the time which had been taken in deciding the question; and it was suggested that a deputation should wait on the Local Government Board. The Clerk pointed out that less than three months had elapsed since the amended plans were sent in, and until these were received the Board were not in a position to consider the granting of an Order at all. The Clerk is to write to the Local Government Board again, and the matter be further considered.

Fatal Accident at Mitcham Gas-Works.—A man named Thompson, in the employ of Messrs. Clayton, Son, and Co., was killed recently while in charge of a job at the Mitcham Gas-Works. In giving evidence at the inquest, his brother stated that deceased was putting on the roof plates of a gasholder, and was standing on a board 11 inches wide, and about 12 feet long. It was supported by poles, which were suspended from the top of the holder; but it was not fastened to the poles in any way. Deceased wanted to work on another part of the roof; and in moving a board, it overbalanced and caused him to fall. Witness did not actually see deceased fall; but on hearing a noise and looking over the side, he saw him lying in the interior of the holder. The work was being carried on in the usual—and, in fact, the only—way. They had to put the roof on in sections, and to continually shift the scaffolding. No other preventive precautions could have been taken. A verdict of "Accidental death" was returned.

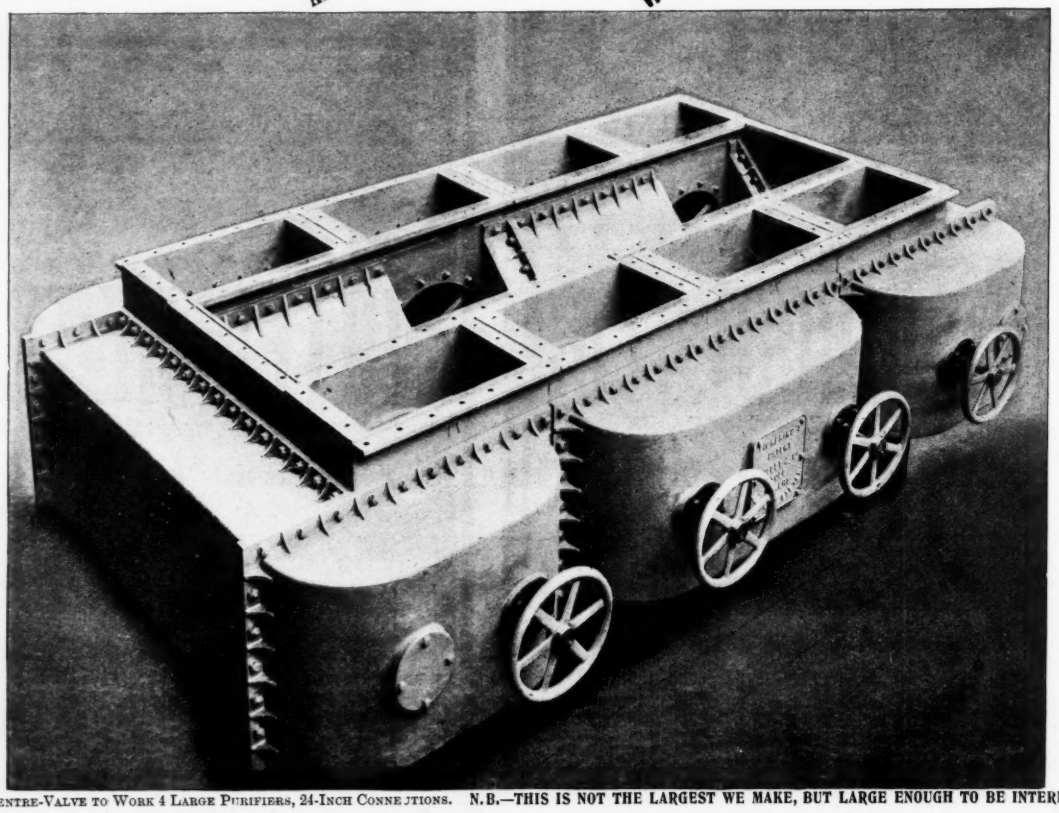
Gas Profits at Manchester.—Instead of a net profit of £34,000, which it was estimated would result from last year's working of the Manchester Gas Department, the actual surplus on all heads, it is stated, exceeds this sum by practically £29,000. Having regard to all the facts, the Committee calculate that during the current year they will be able to make a profit of at least £40,000, after taking into account the reduction of 3d. per 1000 cubic feet to consumers of gas for manufacturing purposes. They have decided that an amount of £50,000 shall again be contributed to the city fund in relief of the rates. The charges for stoves and cookers were some time ago discontinued—a policy which has been amply justified by the large increase that has been derived from this source. The reduced price of gas for manufacturing purposes has also naturally proved popular; it having resulted in an increased sale of about 8 per cent. The consumption by prepayment meter users shows an increase of 9 per cent., as against one of 4 per cent. by the ordinary consumers.

Unsanctioned Expenditure at Leeds.—On behalf of the Local Government Board, Mr. W. O. Meade-King last Thursday held an inquiry with reference to the desire of the Leeds Corporation to borrow £3471, which sum had already been spent on the erection of an electric lighting and gas depôt. The Town Clerk (Mr. R. E. Fox) admitted that the Corporation had been irregular in spending money before going to the Board for sanction. Between 1900 and 1905, he said, the Corporation had been extremely busy with important Parliamentary Bills; and he was afraid that not only this but a number of other amounts were spent before first going to the Board. A deputation from the Finance Committee had visited the Board on the subject of certain loans; and he had undertaken to make application as soon as possible. The present was one of a series in accordance with this undertaking. In November last, the Council passed a Standing Order which would in future prevent any such irregularity. He, however, expressed the view that the action of the Corporation was not illegal, as they could spend money for purposes of this kind entirely at their own discretion.

PICKERING'S PATENT PURIFIER VALVES.

No Connections. Easy to Work Small Cost. Space Saved. Absolutely Sound. Most Simple.

Apply WILLEY & Co., LD., ENGINEERS, LONDON, AND EXETER.



VIEW OF CENTRE-VALVE TO WORK 4 LARGE PURIFIERS, 24-INCH CONNEXIONS. N.B.—THIS IS NOT THE LARGEST WE MAKE, BUT LARGE ENOUGH TO BE INTERESTING.

Sale of Shares.—At a recent auction sale, eight ordinary £25 10 per cent. shares in the Frome Gas Company realized £30 per share.

Incandescent Gas Lighting for Railway Carriages.—According to the "Sydney Herald," the Pintsch incandescent gas-light in railway carriages has proved a great success in Victoria; 33 per cent. more light having been obtained at a cost of 33 per cent. less gas. Consequently it is to be extensively introduced; and the Sydney express trains will, it is understood, be fitted with it.

Gas Preferred to Electricity.—Owing, it is stated, to the unsatisfactory manner in which electricity has worked in connection with the lighting of Galway Dock, the Harbour Commissioners are abandoning it in favour of gas. The Inspector of Irish Lights, in an official report, suggests a local inquiry into the merits of gas and electricity, as he says that pilots have now to take risks on account of disputes in connection with the two lights.

Rochdale Gas, Electricity, and Water Supply.—The profit made by the Gas and Electricity Departments of the Rochdale Corporation in the past financial year amounts to upwards of £17,000, which is £1905 less than it was a year ago. This is attributed to the reduction in the price of gas, the profits from the sale of which total nearly £14,000. The aggregate sum which the two departments intend to use for the relief of the rates is about £12,000. The accounts of the Water Department show a deficiency of £3694.

Electric Power Monopolies.—At the annual conference of the Independent Labour Party held last week at Stockton-on-Tees, Mr. Brockbourne, of West Bromwich, moved a resolution favouring the uniting of groups of municipal authorities for the economical supply of electric power; and the President (Mr. P. Snowden, M.P.), in the course of the debate upon it, remarked that the greatest difficulty in fighting applications by companies was that they were not under the same restrictions as municipalities. The motion was agreed to.

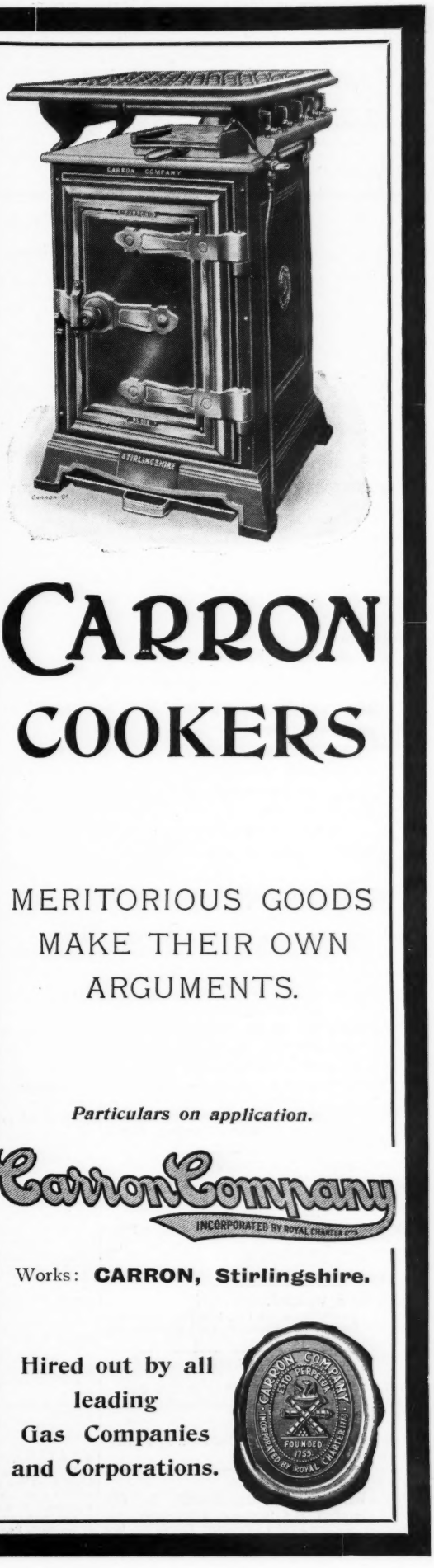
New Joint-Stock Companies.—The Water-Works, Lighting, and Power Investment Corporation, Limited, has been registered with a capital of £2000, in £1 shares (1000 preference, 500 ordinary, and 500 deferred) for the purpose indicated by the title. There will be no initial public issue. The Korean Water-Works Company, Limited, has been registered with a capital of £250,000, in £1 shares, to adopt an agreement with the "S.W." Syndicate, Limited, for the acquisition of a concession for the construction and maintenance of water-works in Seoul and elsewhere in Korea, and to carry on the business of a water company.

Local Government Board Inspector on Incandescent Gas Lighting.—When holding an inquiry at Bridlington into an application by the Corporation for sanction to borrow £3000 for electric lighting purposes, Mr. R. H. Hooper, the Local Government Board Inspector, repeatedly spoke of the importance of economy, and referring to public lighting said he found in all his experience that there was no light like the incandescent gas-lamp—none so good or so cheap. This was his experience wherever he went. The Corporation desired to borrow money for the carrying on of what they termed a public improvement. Well, what did the improvement consist of? It had been said by the Electrical Engineer that the Corporation gave the public better lighting by electricity at a relatively cheaper rate than the price of gas; but he (Mr. Hooper) desired to point out that the Council had been employing the permanent servants of the Electricity Department in doing work for the department, and had charged the time of the officials so engaged to capital account. This must not be continued, for the Local Government Board would insist that the full salaries of permanent servants of the department must be paid out of revenue.

Slot-Meter Robberies.—Writing to the "Birmingham Post," on the subject of slot-meter robberies, a "Victim" contends that the consumer, who is forced to put money in a receptacle provided by the Corporation, is entitled to reasonable security against theft. He says that, "instead of the meter being placed somewhere in the house, it is in a very considerable number of cases placed under the vestibule mat or behind the front door. Apart from the inconvenience of standing on one's head to put a coin in, it is putting a premium on crime to place what is as good as a cash-box on the door-step. As one cannot expect the authorities to remove all these exposed meters, I wish to make a suggestion, which, if carried out, would in a few weeks remedy the evil. The Corporation should issue metal cheques of the equivalent value to a penny, and retail them to consumers through the medium of the collecting agents they have already about the town. Then the consumers would have no one but themselves to blame if they placed current coin in the slot. And, finally, considering that the losses (by no means small—mine amounting to about 10s.) are sustained by the poorest class in the town, the Gas Committee should lose no time in adoping a scheme which would make robbery unprofitable."

The Carron Company have recently held a very successful exhibition of gas appliances at Wigton, Cumberland, under the auspices of the Wigton Gas Company.

Though trade is very bad at Port Elizabeth, it is gratifying to find that the business of the South African Lighting Association is flourishing. According to a letter recently received from the Manager (Mr. W. Arnott), the orders for stoves have been absolutely overwhelming. This branch of the business has been pushed lately by the employment of canvassers, who have made house-to-house visits. So successful were they, that they had to be stopped for a month, to allow of the orders on hand being disposed of—the supply of fitting labour being rather limited. The inquiries from consumers as to when their stoves would be fixed became so numerous that a prominent notice had to be inserted in the local paper to the effect that the Manager could not guarantee the fixing of stoves in less than six weeks from the date of the order. The curious spectacle was thus presented of the Association having absolutely too much work while trade generally was slack to stagnation. In the lighting department, notwithstanding the advent of the electric light, the Association are also busy; one of the latest achievements of Mr. Arnott was the illumination of the Port Elizabeth cricket ground on the occasion of a fête on behalf of the Institute.



CARRON COOKERS

MERITORIOUS GOODS MAKE THEIR OWN ARGUMENTS.

Particulars on application.

Carron Company
INCORPORATED BY ROYAL CHARTER 1773

Works: **CARRON, Stirlingshire.**

Hired out by all leading Gas Companies and Corporations.

The Madrid Municipality have decided to obtain plans for extensive water-works, including the construction of a reservoir.

The Richmond Gas Stove and Meter Company, Limited, have recently fitted up a further number of complete automatic installations, including meter, stove, brackets and pendants, &c., for the Torpoint Gas Company.

The Brymbo Parish Council are contemplating the carrying out of a public lighting scheme; and after considering several kinds of illumination, the Kitson system has been approved by the Lighting Committee. A public meeting is to be called, to decide whether or not the Lighting and Watch Act shall be adopted.

At an extraordinary general meeting of the "Sun" Gas Company, Limited, held on Thursday, resolutions were confirmed to increase the capital of the Company from £100,000 to £165,000 by the creation of 65,000 new preference shares of £1 each. The Company, it may be remembered, issued a prospectus early last November inviting subscriptions for 75,000 shares of £1 each, to bring up the capital to £100,000. It was formed about twelve months ago to exploit a process for the generation of acetylene from carbide of calcium and certain salts and other solids, without the direct intervention of water; and its proposals, which included the purchase of a carbide factory in Sweden, were dealt with in an article which appeared in the "JOURNAL" for Nov. 21.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

RESIDENT ENGINEER AND MANAGER. H. E. Jones and Son, Westminster.
MANAGER. No. 4585. Applications by April 28.
DRAUGHTSMAN. Gibbons Bros., Dudley.
RENTAL CLERK. No. 4588.
SHOW-ROOM MANAGER AND SALESMAN. Gosport Gas Company. Application by May 7.
EXHIBITION ATTENDANT AND CANVASSER. No. 4589.
GAS FITTER. Chertsey Gas Works.

Situation Wanted.

REPRESENTATIVE OF GAS STOVE MAKERS. No. 4590.

Plant (Second-Hand) for Sale.

BARGES. No. 4591.
PURIFIERS AND GASHOLDER. Yorktown and Blackwater Gas Company.

Mantle Factory for Sale. No. 4592.

Engineering Works for Disposal.

LIQUIDATOR, GRAHAM, MORTON, LEEDS.

Stocks and Shares.

CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY. May 8.
LOWESTOFT WATER AND GAS COMPANY. May 8.
NEWCASTLE AND GATESHEAD WATER COMPANY. May 8.
SEVENOAKS WATER COMPANY. May 21.

TENDERS FOR

Coal and Cannel.

BARNOLDSWICK GAS DEPARTMENT. Tenders by May 1.
CAMBORNE GAS COMPANY. Tenders by May 1.
DENTON GAS DEPARTMENT. Tenders by May 3.
INVERNESS GAS COMMISSIONERS. Tenders by April 30.
NORTHWICH GAS COMPANY. Tenders by May 10.
WATFORD GAS COMPANY. Tenders by May 7.

Lime.

INVERNESS GAS COMMISSIONERS. Tenders by April 30.

Meter (Station).

LEIGH-ON-SEA GAS DEPARTMENT. Tenders by April 26.

Tank for Gasholder.

MACCLESFIELD GAS DEPARTMENT. Tenders by May 1.

Tar and Liquor.

DENTON GAS DEPARTMENT. Tenders by May 3.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in Advance. If credit is taken, the charge is 25s. a year.
Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism London."

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

"NUGEPE" GAS PLANT CEMENT.
JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
MANCHESTER, S.W.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

THE KEITH LIGHT.
OVER 3000 INSTALLATIONS IN DAILY USE.
SEE illustrated advertisement in next week's issue.
JAMES KEITH AND BLACKMAN CO., LTD., 27, Farringdon Avenue, LONDON, E.C.

GAS OILS.
MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 8, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,
HOLLAND.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

TAR AND LIQUOR WANTED.
Best Prices paid.
DENT AND CO.,
Ouse Chemical Works, SELBY.

GASHOLDER PAINTING.
PAINTING Work for all kinds of Gas- Works Plant, Roofs, Bridges, &c., undertaken by Contract or otherwise.
FREDERICK BOYALL, 31, Regent's Row, DALSTON, N.E.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

GAZINE—A radical Solvent and Preventative of Naphthalene deposits, which has been used for many years on the Continent for the cleaning of Mains and Services, and is now being adopted in England. It is also used for the Enrichment of Gas, and has an Illuminating Value of double that of 90 per cent. Benzol.
Supplied by C. BOURNE, 120, Manor House Road, NEWCASTLE-ON-TYNE.

OXIDE OF IRON.
(NATURAL.)
BALE & CHURCH will be pleased to send Quotations and Samples on application.
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT for all Retort and Furnace work.
PAINT for Gasholders, Purifiers, &c.
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER, CHAPMAN, & MESSEL, LTD.
(with which is amalgamated WM. PEARCE & SONS, LTD.),
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone 341, AVENUE.

GLASS SHADES of every description, for all kinds of Interior GAS LIGHTING.
Illustrated sheets on application.
JOHN WALSH WALSH,
SOHO AND VESTA GLASS WORKS, BIRMINGHAM.
Telegrams: "VESTA, BIRMINGHAM."
National Telephone: No. 63.
London Show-Room: 4, HOLBORN CIRCUS, E.C.

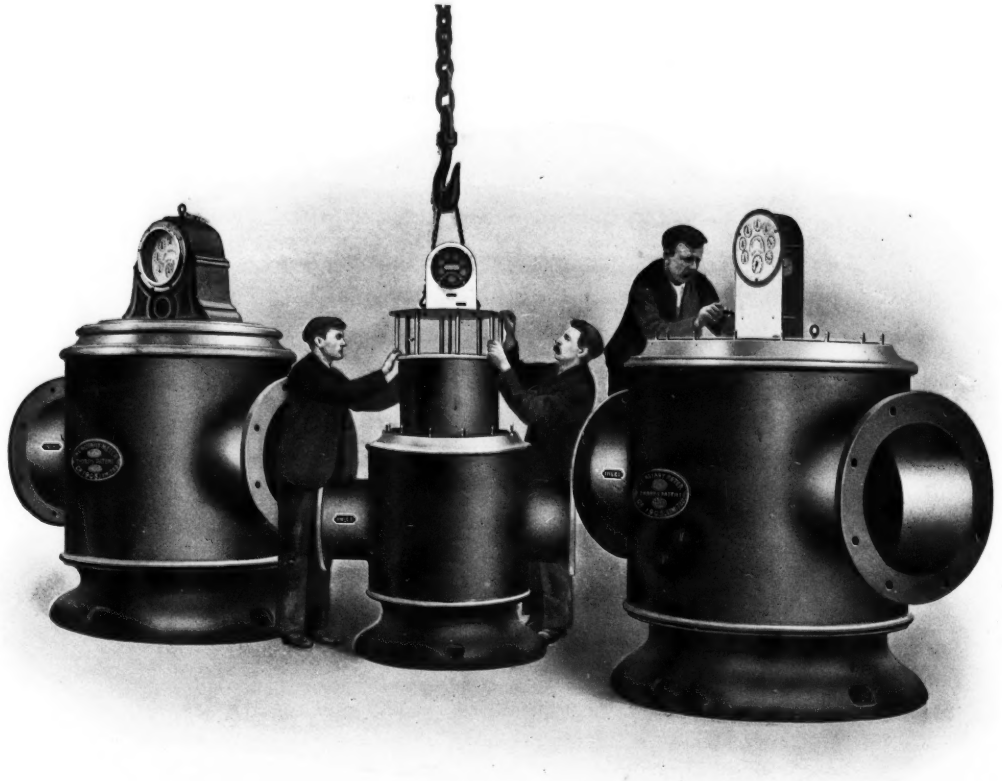
PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

TO WATER AND GAS COMPANIES REQUIRING CAPITAL.
THE Water and Gas Debenture Share Investment Trust, Limited, of 37, High Street, Tunbridge Wells, are prepared to Invest £10,000 Capital in above, and also to Underwrite Progressive Water and Gas Companies' issues.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

Printed and Published by WALTER KING, at 11, BOLT COURT, FLEET STREET, in the CITY OF LONDON.—Tuesday, April 24, 1906.

Putting the finishing touches to Two 60,000 cubic feet per hour and One 30,000 cubic feet per hour Rotary Station Meters.



For Home and Abroad, Meters have been supplied, and are in course of erection, for the measurement of **213,000,000** cubic feet of Gas per day.

Quotations, Drawings, and Specifications, with fullest Particulars for any size of Installation, will be forwarded on application to

T. G. MARSH,

1, Mawson Chambers,

28, Deansgate, MANCHESTER.

Printed and Published by Walter King, at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, April 24, 1906.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia. BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

APPLICANTS for the General Foreman-SHIP of the Scarborough Gas-Works are THANKED and informed that the POSITION HAS NOW BEEN FILLED.

WANTED, by an Experienced Gas-Fitter (Age 30), situation as REPRESENTATIVE for a good Firm of Gas-Stove Makers. Address No. 4590, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

EXHIBITION Attendant and Canvas-SERS required by well-known Gas-Stove Firm. Apply, by letter, stating Experience, &c., to No. 4589, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a good Gas-Fitter. One used to Tapping Mains, Laying Services, and Fitting up Houses, both for Iron and Compo. Pipes. Apply to the MANAGER, Gas-Works, CHERTSEY.

RENTAL Clerk Wanted by a Suburban Gas Company. Apply, by letter, stating Age, Experience, &c., to No. 4588, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a Gas Company in the neighbourhood of London, scale 60 Millions, a Qualified RESIDENT ENGINEER and MANAGER. Applications, in the first instance by letter only, without Testimonials, to be addressed to H. E. JONES AND SON, Palace Chambers, WESTMINSTER.

WANTED, a Draughtsman for Eleva-ting and Conveying Machinery and Structural Steel Work. None need apply unless thoroughly competent of taking out Strains and Stresses of Structure and Large Bunkers. Apply, stating Age, Experience, and Salary required, to GIBBONS BROS., Ltd., Dibdale Works, DUDLEY.

WANTED, a smart, well-informed Man, of good Address, as SHOW-ROOM MANAGER and SALESMAN. Must be accustomed to the control of workmen, the advising of Consumers, preparing Estimates, and have Practical Experience and thorough knowledge of all latest Gas Appliances. Commencing Wages, £2 2s. per week. Apply, by letter, stating Age, Experience, &c., enclosing *copies* of Three Testimonials, to ALFRED LOACH, Secretary, Gosport Gas and Coke Company, GOSPORT, not later than the 7th of May.

GAS-WORKS MANAGER.

WANTED, an Experienced and Thoroughly Competent MANAGER, conversant with every branch of Economical Manufacture and Distribution, including Maintenance of Plant, Main Laying, &c. Complete personal superintendence indispensable. Production about 140 Millions. Commencing Salary, £200, with House (free of Rent, Rates, and Taxes), Fuel, Light, and Water. Duties to commence in September next. Apply, by letter, on or before April 28 next, with Three Testimonials, to No. 4585, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Copper Scrap, 72s.; Brass, 48s.; Zinc, 16s.; Lead Ashes, 8s. Also old Wet Gas-Meters bought. ROSSE WORKS, Leeds Road, BRADFORD.

THE London and Provincial Gas-Works Corporation, Parliament Chambers, Westminster, are prepared to PURCHASE outright for Cash a GAS-WORKS where, by the introduction of additional Capital, there would be scope for further extension and development. Address, with full Particulars, as above.

INCANDESCENT Mantle Factory for immediate SALE. London. Low Rental. For Price and Full Particulars, apply No. 4592, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere. J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

GAS PLANT FOR SALE.

THE Yorktown and Blackwater Gas Company have FOR SALE: Two 10-feet square PURIFIERS, with 6-inch Connections and Valves complete, in first-class condition. Also a small GASHOLDER, 25 feet diameter and 12 feet deep, with Columns, Chains, and Balance-Weights complete (without Tank). Any reasonable Offers will be considered. For further Particulars apply to the undersigned.

J. MEIKLEJOHN,
Engineer and Manager.

April 11, 1906.

TOWER-SCRUBBER, 8 feet by 60 feet, in Cast-Iron Segment Plates, with Boards, Water Distributor, and Washer in the bottom. Equal to New. By Dempsters'. Re-erected half price. PURIFIERS, 10 feet to 20 feet square, and other PLANT. FIRTH BLAKELEY CO., Thornhill, DEWSBURY.

BARGES for Sale—Owing to the illness of the Proprietor, a Fleet of Steel and Wooden Barges suitable for Gas Companies, Contractors, &c., to be disposed of. All in first-class condition. Apply, by letter, to No. 4591, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

NORTHWICH GAS COMPANY.

THE Directors of the Northwich Gas Company invite TENDERS for the supply of about 7000 Tons of GAS COAL during the Year ending June 30, 1907. Full Particulars and printed forms of Tender may be had on application to the undersigned. Tenders, endorsed "Coal," are to be sent in addressed to the Chairman by Thursday, May 10, 1906.

SAML. S. MELLOR,
Manager and Secretary.

Gas-Works, Northwich,
April 20, 1906.

DENTON URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

COAL.

THE Gas Committee invite Tenders for the supply of COAL; the same to be sent in on or before the 3rd of May prox. Specification and Form of Tender to be obtained from the Gas Engineer, Mr. J. Chadwick Smith, Gas-Works, Denton, near Manchester. The Committee do not bind themselves to accept the lowest or any Tender.

By order,
WILLIAM RICHARDS,
Clerk of the Council.

April 19, 1906.

DENTON URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

TAR.

THE Gas Committee invite Tenders for TAR; the same to be sent in on or before the 3rd of May prox. Particulars may be obtained from the Gas Engineer, Mr. J. Chadwick Smith, Gas-Works, Denton, near Manchester. The Committee do not bind themselves to accept the highest or any Tender.

By order,
WILLIAM RICHARDS,
Clerk of the Council.

April 19, 1906.

MACCLESFIELD CORPORATION.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Construction and Erection of a STEEL GASHOLDER TANK, 122 feet diameter, 26 feet 9 inches deep, with Two-Lift Telescopic Gasholder and Connections. A copy of the Specification may be obtained, and the Drawings seen, on application to the Engineer, Mr. Wm. Newbigging, at the Gas-Works, Macclesfield, or at 5, Norfolk Street, Manchester, on deposit of Two Guineas, returnable on receipt of a *bonâ-fide* Tender. Sealed Tenders, endorsed "Gasholder Contract No. 2," to be addressed to the Chairman, Gas Committee, Town Hall, Macclesfield, to reach there not later than noon on Tuesday, the 1st of May, 1906.

By order,
ARTHUR T. PATTINSON,
Town Clerk.

URBAN DISTRICT COUNCIL OF BARNOLDSWICK.

THE above Council invite Tenders for the supply of 4000 Tons of best screened GAS COAL, delivered free on rail, Barnoldswick Station (Midland Railway) or Canal Wharf (Coates), between July 1, 1906, and June 30, 1907, in such quantities monthly as required. The Council reserve the right to divide the quantity between two or more Contractors. The Council do not bind themselves to accept the lowest or any Tender. Forms of Tender supplied on application to the undersigned. Tenders must be on the prescribed Forms, and addressed to the Chairman, Gas Committee, Town Hall, Barnoldswick, and delivered not later than Tuesday, May 1, 1906.

J. W. THOMPSON,
Manager.

Town Hall, Barnoldswick.

TENDERS FOR GAS COAL.

THE Directors of the Watford Gas and Coke Company invite TENDERS for the supply of their requirements of GAS COAL for One, Two, or Three Years at the rate of 10,800 Tons (more or less) per annum. The Coal to be screened or unscreened and to be delivered at the Bushey Station of the London and North Western Railway commencing July 1, 1906. Forms of Tender and all Information may be obtained on application, in writing only, to me, the undersigned. Tenders must be on the Form supplied, any alteration of which will invalidate the Tender. Tenders to be delivered on or before the 7th day of May, 1906, addressed to the Chairman of the Watford Gas and Coke Company, Watford, endorsed "Tenders for Gas Coal." The Directors do not bind themselves to accept the lowest or any Tender.

J. DUNCAN ROYAL,
Secretary.

Watford Gas and Coke Company's Offices,
Watford, April 12, 1906.

THE Directors of the Camborne Gas Company, Limited, invite TENDERS for 1250 Tons of GAS COAL delivered f.o.b. to their order up to May 1, 1907. An alternative price c.i.f. Hayle may be quoted. The lowest Tender will not necessarily be accepted. Tenders should be addressed to the Secretary, and should reach Camborne on or before Tuesday, May 1.

By order,
W. BAILEY,
Secretary and Manager.

Dated Camborne,
April 23, 1906.

LEIGH-ON-SEA URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE above Council invite Tenders from competent Manufacturers for the supply, delivery, and fixing of a Cylindrical STATION GAS-METER, capable of passing 5000 cubic feet per hour under a pressure not exceeding 2½ inches, with Bye-Pass Valves, and Connections to existing Mains complete. Sealed Tenders to be delivered to the undersigned not later than Ten a.m. on Thursday, the 26th inst. The Council do not bind themselves to accept the lowest or any Tender.

W. CARLYLE CROASDELL,
Clerk to the Council.

Council Offices, Leigh-on-Sea,
April 12, 1906.

CONTRACT FOR COAL AND SHELL LIME.

THE Inverness Gas Commissioners are prepared to receive OFFERS for 8500 Tons of CANNEL and GAS COAL, to be delivered f.o.b. at Ports on Firth of Forth, or delivered free at Inverness over a period of Six or Twelve Months, at the option of the Commissioners; also 300 Tons of SHELL LIME, to be delivered free at Inverness. Tender Forms and further Information may be had by applying to the Manager at the Gas-Works. Tenders, endorsed and addressed to Kenneth MacDonald, Esq., Clerk to the Commissioners, will be received up to Monday, the 30th curt.

Gas-Works, Inverness,
April 16, 1906.

SEVENOAKS WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the Sevenoaks Water-Works Company, in pursuance of their Provisional Order of 1900, as confirmed by Act of Parliament, being desirous of increasing their Capital, have resolved to issue FIVE HUNDRED AND TWENTY 4 PER CENT. PREFERENCE SHARES of Ten Pounds each. Tenders are hereby invited from the public for the same at not less than par value. The present issue of Capital is made to provide for the completion of the Additional Pumping Plant, Reservoirs and Mains at Seal Chart, Stone Street, and Bitchet, now under construction. The Company are paying the Maximum Dividend, together with back Dividends on their Stock and Ordinary Share Capital. Tenders are to be addressed to the Company at their Offices, Oak Lane, Sevenoaks, on or before Monday, the 21st day of May, 1906, and endorsed "Tender for Shares." The Shares are payable as under—viz.:

£2 on application,
£3 on allotment,

and the Balance within three months of allotment. Where no allotment is made, the deposit will be returned in full. Forms of Tender on application at the Company's Offices.

By order of the Board,
ALFRED GRAINGER,
Secretary.

Water-Works Offices,
Oak Lane, Sevenoaks,
April 12, 1906.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C. Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY.

NEW ISSUE OF £3000 CONSOLIDATED ORDINARY STOCK,
AND
£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 8, at Two o'clock, in Lots. Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

LOWESTOFT WATER AND GAS COMPANY.

NEW ISSUE OF 400 ADDITIONAL ORDINARY £10 SHARES,
Ranking for a Maximum Dividend of 7 per cent. equally with similar Shares now receiving 5½ per cent.;
ALSO
£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 8, at Two o'clock, in Lots. Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

NEWCASTLE AND GATESHEAD WATER COMPANY.

TO be Sold by Auction, in the Board Room of the Company's Offices, Pilgrim Street, Newcastle-on-Tyne, on Tuesday, May 8, 1906, at Half-past Twelve o'clock precisely, by

Mr. CHARLES A. JOEL,

in such Lots as are provided for in the said Company's Acts of 1902—

FIFTY THOUSAND POUNDS FIVE PER CENT. PREFERENCE STOCK (1902).

Printed Particulars and Conditions of Sale may be had at the COMPANY'S OFFICES, and Messrs. GEORGE ARMSTRONG AND SONS, Solicitors, NEWCASTLE-ON-TYNE; or of the AUCTIONEER, 27, Northumberland Street, NEWCASTLE-ON-TYNE.

GEORGE SMITH,
Secretary and General Manager.

Newcastle-on-Tyne,
April 2, 1906.

Re **GRAHAM, MORTON, LIMITED.**

IN LIQUIDATION.

FOR SALE, the Freehold Land (about 4½ Acres), together with the Buildings thereon, forming the Works carried on by the above Engineering Company at Hunslet, Leeds.

The Main Buildings (covering about 7000 square yards) are in three bays, each about 380 feet long, two of which are about 50 feet span and one about 38 feet span, in use as Structural Shop and Engineering Department. Each bay in the Structural Shop is fitted with two 10-ton, and the Fitting Shop with one 6-ton, Electric Travelling Cranes.

The Motive Power is situated at the end of the building, and consists of a Lancashire Boiler with Superheater supplying Two 200-horse power High-Speed Belliss & Morcom Vertical Engines, directly coupled to Generators supplied by the Electric Construction Company. There is a large set of Hydraulic Pumps with Accumulator, giving a pressure of 1200 lbs. per square inch; also a spare Auxiliary Vertical Engine.

The Works are admirably equipped with Motors driving short main shafts; thus securing economical running.

The Premises are fitted throughout with Electric Light. A 10-ton Electric Travelling Crane on Gantry, about 30 feet span by 380 feet long, provides excellent lifting accommodation over a large portion of the yard.

A Railway Siding connected with the Great Northern Railway Company runs direct into the Works, and lines of Rails and Turntables of the same gauge are laid over the Works and a considerable portion of the Yard.

An excellent suite of Offices and Storerooms, &c., with frontage on the main road, are adjoining the Works.

For further Particulars and Orders to View, apply to the LIQUIDATOR, Mr. Robert Hilditch (Armitage and Norton, Chartered Accountants), at the Works, Pepper Road, Hunslet, LEEDS.

Now Ready. Price 17s. 6d. net.

COMPOUND DIVISION,

COST SHEET,

READY RECKONER,

DESIGNED FOR QUICKLY CALCULATING ANY NUMBER OF ARTICLES IN PENCE AND THREE PLACES OF DECIMALS OF A PENNY,

From 1 to 10,000, thence by Tens to 100,000.

For use in making out Cost Sheets of Collieries, Ironstone and other Mines, Iron, Gas, and Water Works, Quarries, and Manufactories generally. For Accountants, Merchants, Public and Private Offices,

AND

Wherever the Cost of a Gross Number is Required to be Reduced to One in 0·000.

By WM. P. WETHERED,

"REDCOURT," MOSSLEY HILL, LIVERPOOL.

THIRD EDITION.

London: WALTER KING, 11, Bolt Court, Fleet St., E.C.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

NOW READY, THE SECOND EDITION OF

GAS COMPANIES'

BOOK-KEEPING.

A Practical Treatise on the Keeping of Gas Companies' Accounts.

By
JOHN HENRY BREARLEY, and
BENJAMIN TAYLOR.

THE VOLUME CONTAINS TWO WORKS:

1—Gas Companies' Book-Keeping.
2—Useful Forms for Gas Undertakings.

Price Net: Complete, Cloth Bound, 12s. 6d.; Morocco Gilt, 18s.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

GILBERT LITTLE & CO. LTD.

Conveyor and Elevator Specialists,
Smethwick, Birmingham.

Make known your wants for Conveyors and Elevators to GILBERT LITTLE, the Pioneer Specialist; he will supply them.

THE

"BOYS"

CALORIMETER

for determining the calorific value of gases

IS MADE BY

JOHN J. GRIFFIN & SONS,

— LIMITED, —

Makers of Scientific Apparatus,

KINGSWAY, LONDON, W.C.

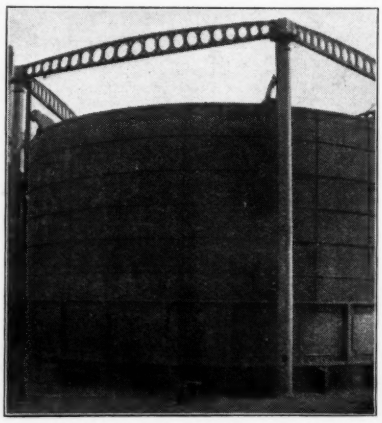
THIS

GASHOLDER FOR SALE

30 ft. diameter by 14 ft. deep, about 9500 cubic feet capacity.

IN GOOD CONDITION.

SUIT EITHER BRICK or METAL TANK.



Existing Cast-Iron Tank is not for Sale, but a cheap Steel Tank will be Quoted if Required.

SAML. CUTLER & SONS,

MILLWALL, LONDON.

No. 217.

MIRFIELD GAS COAL

UNEQUALLED.

Sperm Value 878·85 lbs. per Ton.

Please apply for Prices, Analyses, and Reports, to the

MIRFIELD (GAS COAL) COLLIERIES

RAVENSTHORPE, NEAR DEWSBURY.

LONDON: 22, Park Village East, N.W.

HEATHCOTE GAS COAL.

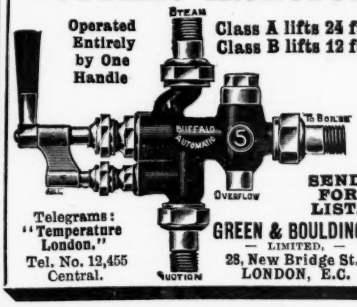
Rich in Illuminating Power and yield of Gas Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,

CHESTERFIELD.

'BUFFALO' INJECTOR



SEND FOR LIST.

Telegrams: "Temperature London." Tel. No. 12,455 Central.

GREEN & BOULDING,
— LIMITED, —
28, New Bridge St., LONDON, E.C.

JOHN HALL & CO. OF STOURBRIDGE,

LIMITED,

STOURBRIDGE,

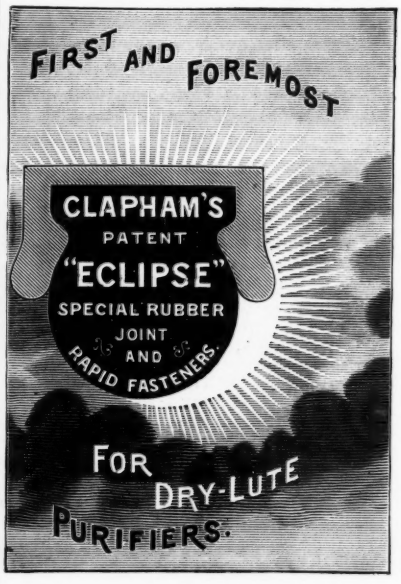
Manufacturers of

FIRE-BRICKS, LUMPS, TILES,

GAS RETORTS,

And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED FOR SHIPMENT.



TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: H. CRESSWELL & Co., LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large Stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

The Telegraphic Address
OF THE
STAFFORDSHIRE TUBE CO., LIMITED,
IS STILL
"UNBEATEN
BIRMINGHAM."

THE
"ROTARY"
STATION METER.
Efficiency
Demonstrated.
APPLY—
T. G. MARSH,
MAWSON CHAMBERS, DEANSGATE,
MANCHESTER.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1805.

THOMAS TURTON
AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY,
LONDON OFFICE:
90, CANNON STREET, E.C.

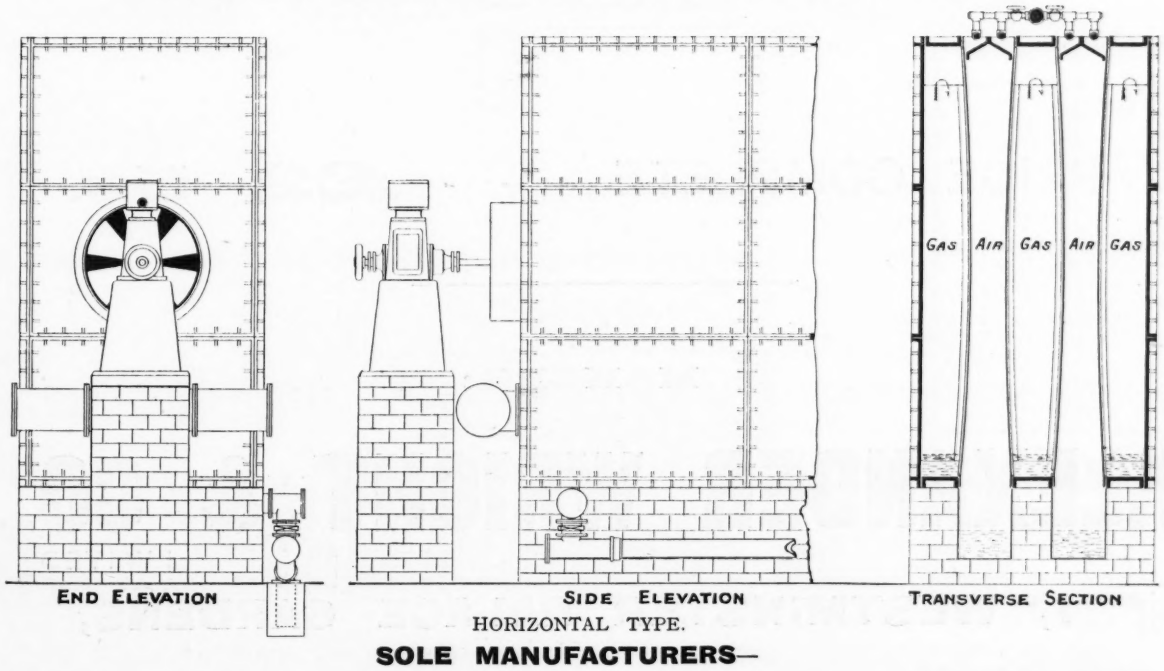
THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

MIDLAND AND WEST OF ENGLAND DISTRICT OFFICE: *6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.*
Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone No. 200.
LONDON DISTRICT OFFICE: *6, STRAND, LONDON—C. PARKER & SON, Sole Agents.*
Telegraphic Address: "Parker, London."

BROWNE & CHANDLER'S PATENT
Vaporizing Condensers.

In these Air Condensers a greatly increased efficiency is secured by Internal Evaporation of a comparatively trifling quantity of water, with or without Fan draught.



END ELEVATION SIDE ELEVATION TRANSVERSE SECTION
HORIZONTAL TYPE.

SOLE MANUFACTURERS—
MESSRS. W. J. JENKINS & CO., LTD., RETFORD.

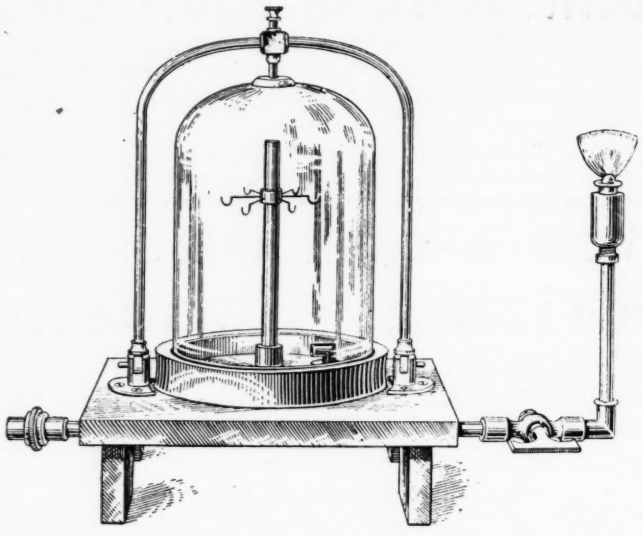
THE NEW

SULPHURETTED-HYDROGEN

APPARATUS

(DIFFUSION PATTERN),

As prescribed for Official use in London.



PRICE COMPLETE - - - **£2 5s.**

MAKERS:

ALEXANDER WRIGHT & CO., LIMITED

1, WESTMINSTER PALACE GARDENS,

ARTILLERY ROW, VICTORIA STREET, S.W.

WELSBACH LIGHT

(PATENTED)

Fig. 35. 100 c.p.

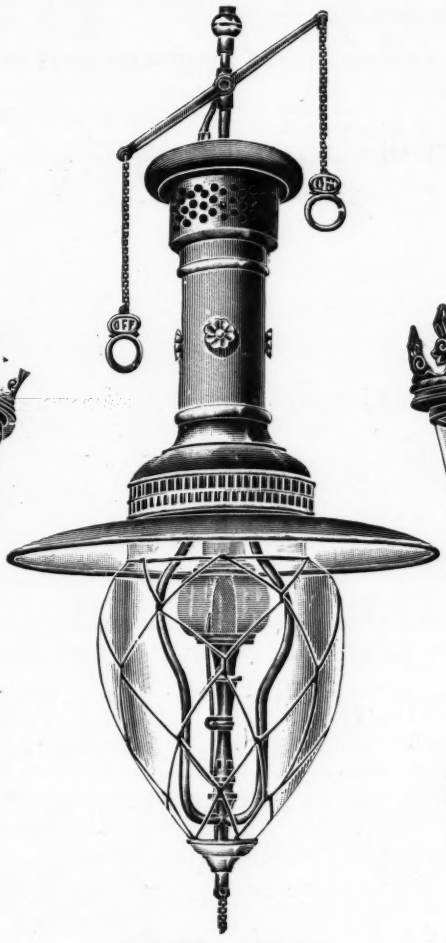


Fig. 607. 600 c.p.
Self-Intensifying.

Fig. 35a. 300 c.p.
Self-Intensifying.

WELSBACH "C," "CX," AND PLAISSETTY MANTLES,

4½d. each, subject.

Thousands of the above Lamps in use and giving satisfaction.

EACH LAMP AND MANTLE GUARANTEED.

THE

WELSBACH INCANDESCENT GASLIGHT CO.

LIMITED,

2 to 14, Palmer Street, WESTMINSTER, S.W.

Telegrams: "WELSBACH, LONDON" *Telephone: 290 WEST.*

PATENT
"FLUXITE"
FIRE
CEMENT
For
STOPPING CRACKS
IN GAS RETORTS.
Makers: JOHN E. WILLIAMS & CO., Lower Moss Lane, MANCHESTER, S.W.

BOWENS' Ltd. Successors,
STOURBRIDGE.
MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
ESTABLISHED 1860.

GASHOLDER PAINT SPECIALISTS.
OUR AIM IS QUALITY.

TO BUY THE PUREST IS THE BEST AND MOST SATISFACTORY.
ALL PAINTS GUARANTEED TO BE GROUND IN PURE LINSEED OIL.

ARCHD. H. HAMILTON & CO.,
Possilpark Paint Works, GLASGOW.
Telegrams: "SATISFY."

S. S. STOTT & CO.,
ENGINEERS,
HASLINGDEN, nr. MANCHESTER.
LIME & OXIDE ELEVATORS & CONVEYORS.
COAL AND COKE STORAGE PLANTS.
Coal and Coke Elevators and Conveyors.
STAMPED AND RIVETTED STEEL ELEVATOR BUCKETS.
DETACHABLE CHAINS AND SPROCKET WHEELS.
HIGH-CLASS STEAM ENGINES. BEAM PUMPING-ENGINES, &c.

THOMAS BUGDEN,
India-Rubber, Guttapercha, Air-proof, and Waterproof Manufacturer,
116 & 118, Goswell Road,
LONDON.

Gas Bags for repairing Mains Round Shape. All Seams Stitched and Taped.

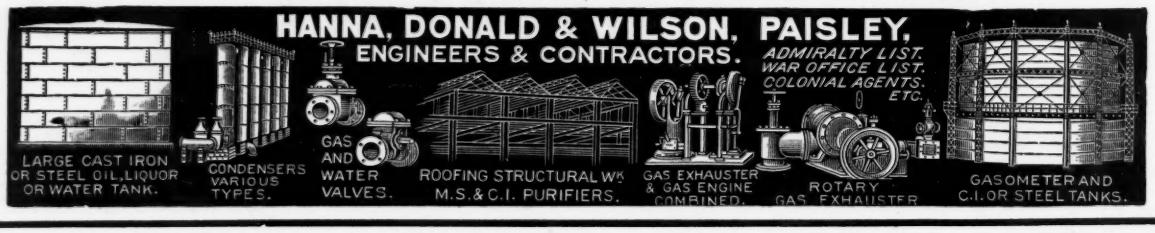
Gas Bags for repairing Mains Cylinder Shape. All Seams Stitched and Taped.

Oilskin Clothing, Diving and Wading Dresses, Sewer Boots, Tar Hose, Stokers' Mitts, Bellows, &c.
Sewer and Fireman's Boots and Stockings.

ORIGINAL MAKER OF
GAS BAGS FOR MAINS.

Contractors' and Miners' Woollen Jackets, Trousers Hats, &c.

HARRIS & PEARSON,
STOURBRIDGE, ENGLAND,
MANUFACTURERS OF
FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.
GLAZED BRICKS AND PORCELAIN BATHS.


HANNA, DONALD & WILSON, PAISLEY,
ENGINEERS & CONTRACTORS.
ADMIRALTY LIST.
WAR OFFICE LIST.
COLONIAL AGENTS.
ETC.
LARGE CAST IRON OR STEEL OIL, LIQUOR OR WATER TANK.
CONDENSERS VARIOUS TYPES.
GAS AND WATER VALVES.
ROOFING STRUCTURAL WK M.S. & C.I. PURIFIERS.
GAS EXHAUSTER & GAS ENGINE COMBINED.
ROTARY GAS EXHAUSTER
GASOMETER AND C.I. OR STEEL TANKS.

THE LEEDS FIRECLAY CO., LTD.,
CLIFF'S BRAND. INGHAM'S BRAND.
Fire-Bricks, Lumps, Tiles, &c., &c.
SPECIALLY HARD LUMPS FOR WATER-GAS CARBURETTORS & SUPERHEATERS.
Patent MACHINE-MADE RETORTS
Stoking Machinery is now in general operation at all large works, and the use of same has thrown a greater strain on the Retorts, thus the latter have to withstand a greater amount of wear and tear than formerly. After experimenting, we have succeeded in producing a Retort much harder in its general texture and composition, which we feel confident will give satisfactory results.
LONDON: 2 & 3, NORFOLK STREET, STRAND, W.C.
LEEDS: Wortley. LIVERPOOL: 21, Leeds Street.

METHANE-HYDROGEN GAS.

INVALUABLE FOR GAS-WORKS.

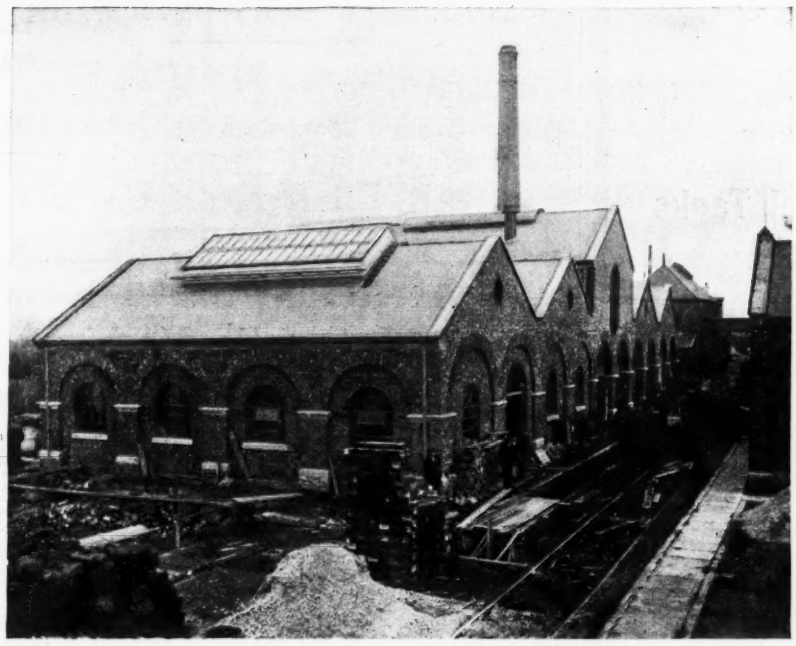


Photo. showing Methane-Hydrogen Plant under construction at the Great Western Railway Gas-Works, Swindon.

NO OIL REQUIRED.

The Methane-Hydrogen Apparatus uses **TAR** instead.

BIGGS, WALL, & CO.

Gas Engineers,

13, Cross Street,

FINSBURY, LONDON, E.C.

AND

HAMPDEN WORKS, NEW SOUTHGATE.

Every Description of

FIRE-CLAY GOODS

OF BEST QUALITY ONLY.

Personal attention given to all orders.

MOBBERLEY & PERRY, STOURBRIDGE.

INCLINED AND HORIZONTAL RETORTS of both Taper and Parallel Sections.

SPECIALS FOR WATER GAS PLANTS.

CHECKER BRICKS ALWAYS IN STOCK.

LARGE STOCKS KEPT.

GAS THE WINSTANLEY SPECIALTY COY. ENGINEERS

GAS ENGINEERS.

Contractors for, and Erectors of, all Gas-Works Plant.

REGENERATORS, GENERATORS, AND DIRECT-FIRED RETORTS.

RESULTS GUARANTEED.

Complete Installations of Horizontal and Inclined Retorts.

ADDRESS—

NEWTON CHAMBERS, CANNON STREET, **BIRMINGHAM.**

Gasholders

AND

GAS PLANTS.

Tanks,

CAST-IRON AND STEEL.

Patent Pressed Steel Tanks from Stock.

HUMPHREYS & GLASGOW'S CARBURETTED WATER-GAS PLANTS.

Steel Structures

of every description.

THOMAS PIGGOTT & CO., LTD.,

Telegrams: "ATLAS, B'HM." BIRMINGHAM. Telephone: B'HM: 86 & 4546.

London Office: 63, QUEEN VICTORIA ST.

TIMMIS'S PATENT

CLINKERING DOOR.

Illustrated Advertisement, with full Particulars, in "JOURNAL" for April 4, 1905, p. 66.

GEO. H. TIMMIS,

River Stour Works, STOURBRIDGE.

Telegrams: "TIMMIS, LYE." National Telephone: 13, LYE.

or of HARPER & MOORES, LTD., STOURBRIDGE.

ARROL-FOULIS

Patent Automatic Machinery FOR

DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,

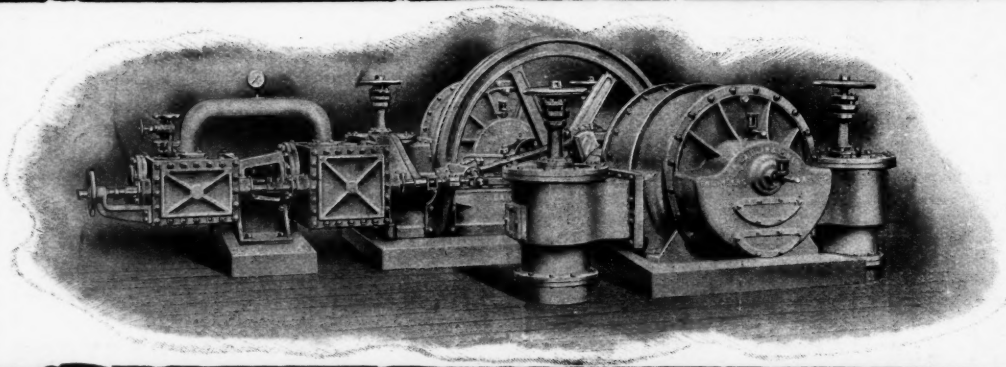
GLASGOW.

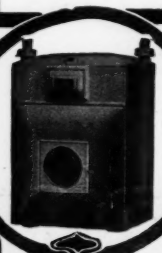
[See Illustrated Advertisement, April 3, p. 74.]

R. LAIDLAW & SON,

LIMITED

GAS & WATER ENGINEERS,



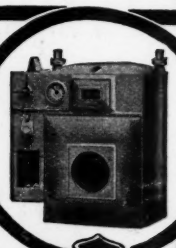


ONE OF FOUR SETS OF TWO EXHAUSTERS & HORIZONTAL TANDEM COMPOUND NON-CONDENSING STEAM ENGINE HAVING A TOTAL

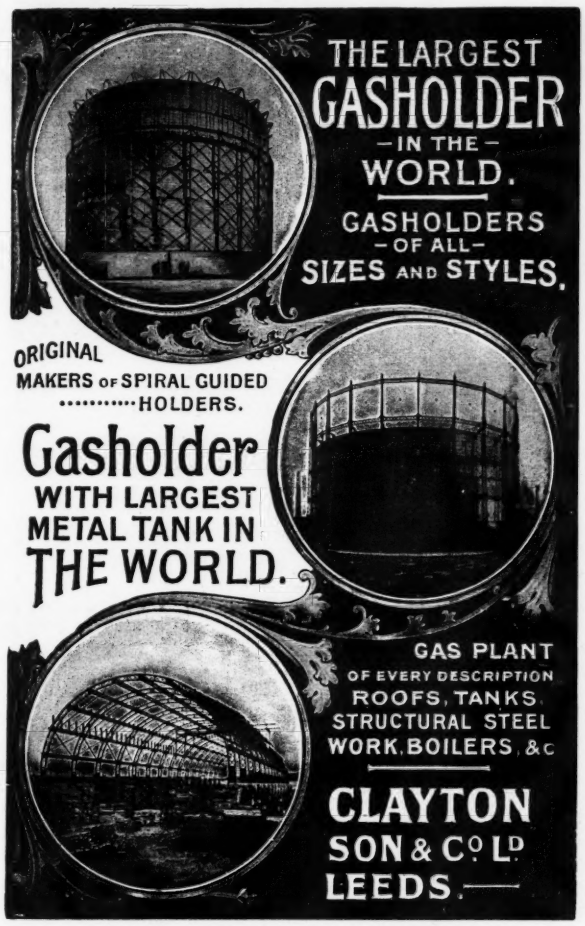
SIMON SQUARE WORKS, EDINBURGH

CAPACITY OF 1200000 CUB. FT OF GAS PER HOUR AT 80 REVS PER MIN. ERECTED AT NECHELLS GAS WKS. BIRMINGHAM.

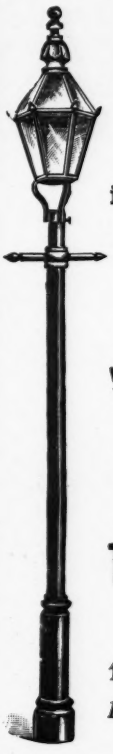
6 LITTLE BUSH LANE, LONDON, E.C.



ALLIANCE FOUNDRY & GLASGOW ENGINEERING WORKS,



MANNESMANN



LAMP POSTS

made throughout of
WELDLESS STEEL TUBING
including base, ring, and ladder rest.

Light, Strong, Unbreakable, and Cheap.

GAS, WATER, & STEAM TUBES AND FITTINGS.

WELDLESS STEEL SPIGOT & FAUCET PIPES
for Gas and Water Mains.

Tubes can be supplied up to 10 inches diameter and in lengths up to 40 feet.

THE BRITISH MANNESMANN TUBE COMPANY, LTD.,
110, CANNON ST., LONDON, E.C.
Birmingham Depôt: Bridge Works, LISTER ST.
Works: LANDORE, SOUTH WALES.

MESSRS. SAML. CUTLER & SONS

Are the Sole Licensees and Manufacturers of the following Patent Grids for Increasing the Efficiency of Purifiers:

JÄGER GRIDS and the Jäger System of Purification for obtaining the greatest efficiency from Purifiers. **Reduced Speed. Reduced Pressure. Long Time Contact. Horizontal Flow of Gas.**

MORRIS GRIDS for use in conjunction with Jäger Conduits and Distributing Chambers.

VERTICAL GRIDS Jäger System without Conduits for partial relief of overtaxed Purifiers retaining Vertical Flow of Gas.

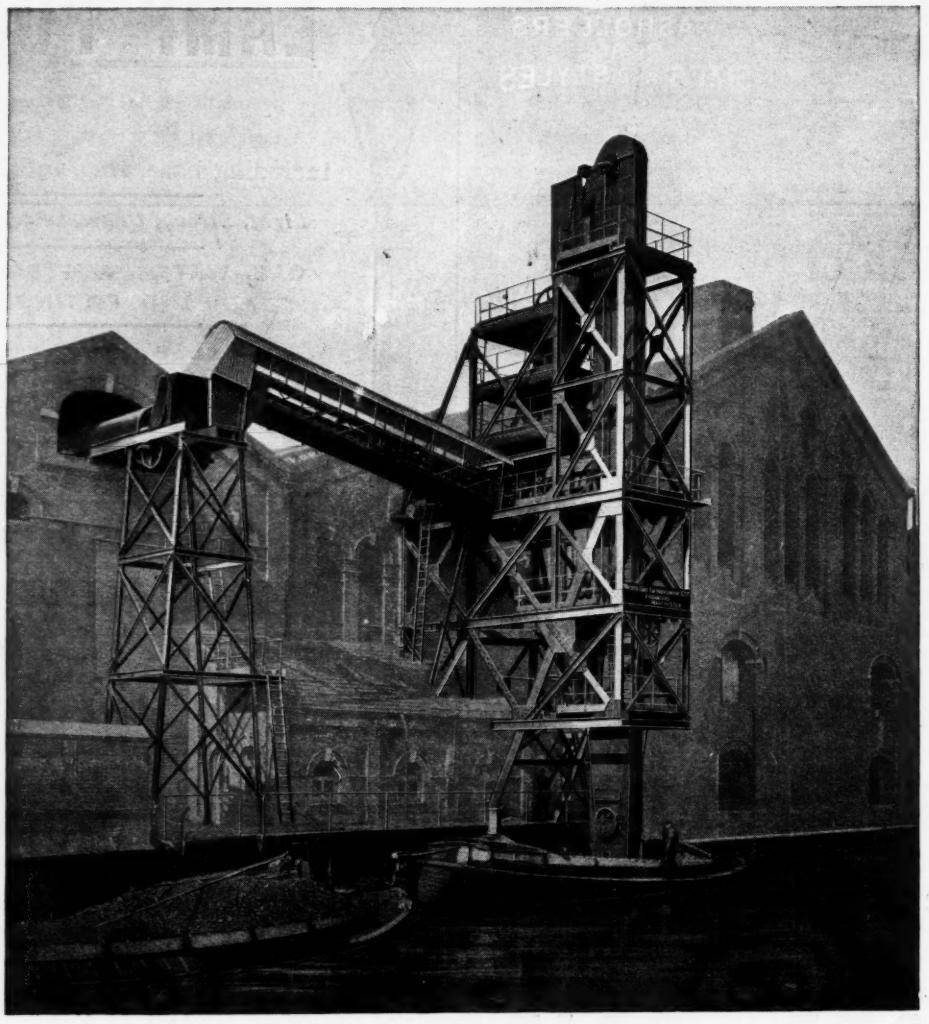
WRITE FOR SPECIAL DESCRIPTIVE CIRCULARS.

SAML. CUTLER & SONS, MILLWALL, LONDON.

No. 218.

WEST'S GAS IMPROVEMENT CO., LTD.,

GAS AND GENERAL ENGINEERS.



PHOTOGRAPH SHOWING

West's Coal Handling Plant for unloading Barges, Elevating, Breaking, Automatic Weighing, Conveying, and Storing the Coal in Stores.

STOKING MACHINERY SPECIALISTS

Over 140 Installations of West's Stoking Machinery now at work.

West's Patent Coke-Conveyors.
,, ,, Regenerator Settings.
General Structural Ironwork.

The Bournemouth Arch-Pipe.
Belton's Relief Apparatus for Hydraulic Mains.

ADDRESS—ALBION IRONWORKS, MILES PLATTING, MANCHESTER.

Telegrams: "STOKER, MANCHESTER." **Telephone Nos. 1339 & 5520.**

Printed and Published by WALTER KING, at No, 11, BOLT COURT, FLEET STREET, in the CITY OF LONDON—Tuesday, April 24, 1906.